LIBRARY A. B. C. F. M.

APRIL, 1894.

VOL. III. NO. 4.

The Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.

SUMMARY OF CONTENTS.

(For Details, see over.)

	PAGE
Across Iceland. By KARL GROSSMANN, M.D., F.R.C.S.E.	261
Johore. By HARRY LAKE, Engineer in the service of the Sultan	281
Recent Contributions to Oceanography. By H. N. DICKSON, F.R.S.E.	302
Count Széchenyi's Travels in Eastern Asia. By Baron F. VON RICHTHOFEN	311
The Pampas. By P. KROPOTKIN	318
Dr. Cvijić on the Phenomena of Limestone Regions	321
Northern Greece. By Dr. A. PHILIPPSON	323
The Kizil Irmak—the Ancient Halys. By Lieut. MÄRCKER	327
The Monthly Record	329
Correspondence	339
Obituary—Sir HARRY VERNEY, Bart. General SAUNDERS ABBOTT. By Major BROADFOOT, R.E.	340
Meetings of the Royal Geographical Society, Session 1893-94	342
Geographical Literature of the Month	343
New Maps	353
Maps and Illustrations.	

PUBLISHED UNDER THE AUTHORITY OF THE COUNCIL.
EDITED BY THE ASSISTANT SECRETARY.

LONDON:
THE ROYAL GEOGRAPHICAL SOCIETY, 1, SAVILE ROW;
EDWARD STANFORD, 26 AND 27, COCKSPUR STREET, CHARING CROSS, S.W.

[To Non-Fellows, Price 2s.

H. SOTHERAN & CO.,

Booksellers, Bookbinders & Publishers.

GENERAL AGENTS FOR PRIVATE BOOKBUYERS & PUBLIC INSTITUTIONS

In India, the Colonies, America, and foreign parts.

A MONTHLY CATALOGUE of SECOND-HAND BOOKS: Specimen No. post free.

LIBRARIES PURCHASED OR VALUED FOR PROBATE.

Telegraphic Address: BOOKMEN, LONDON. Code in Use: UNICODE.

140, STRAND, W.C., & 37, PICCADILLY, W.

INFLUENZA, TYPHOID, DIPHTHERIA.

GUARD AGAINST WATER IMPURITIES

And secure the very best Table Waters by ordering

BURROW'S ALPHA - BRAND MALVERN WATERS.

"Sparkling Malvernia," Malvern Seltzer, Malvern Soda, Potash & Lithia Waters, &c.

IMPORTANT NOTICE.—The Pure Natural Malvern Spring Water (Alpha Brand) in stoppered Wine-quart Bottles for the Table is the Safest Drinking Water. The Safeguard of Health. Will keep good for any length of time.

Cases of Six Dozen Bottles sent CARRIAGE PAID.

Address—W. & J. BURROW, THE SPRINGS, MALVERN.

EDWARDS' DESICCATED SOUPS

IN FOUR VARIETIES.

BROWN—TOMATO—WHITE VEGETABLE—GRAVINA.

From their condensed form and keeping qualities, they are especially suitable for travellers, and all who have to camp out. These Soups are invaluable in countries where vegetables are scarce. Each pound makes 6 quarts (15 pounds) of rich Soup.

"I find the force value of the Soup is more than double that of an equal weight of beef."—Professor GOODFELLOW.

"My hands are benumbed with the damp cold: still, a bowl of EDWARDS' DESICCATED SOUP—the best of all travelling soups—has been very reviving."—*Vide "Travels in Persia and Kurdistan,"* by Mrs. BISHOP (Miss BIRD).

SAMPLES FREE ON APPLICATION TO

FREDK. KING & CO., Ltd., 3, 4, 5, & 6, CAMOMILE STREET, LONDON.

SPRATT'S PATENT

LIMITED,

SHIP AND ARMY BISCUITS.

Purveyors to Dr. NANSEN'S EXPEDITION,

And those of THE ROYAL GEOGRAPHICAL SOCIETY.

SAMPLES ON APPLICATION.

SPRATT'S PATENT LIMITED, BERMONDSEY, LONDON.

The Geographical Journal.

Authors are alone responsible for their respective statements. In MS. communications all new or unfamiliar geographical names should be written in imitation of Roman type.

CONTENTS.—APRIL.

	PAGE
Across Iceland. By Karl Grossmann, M.D., F.R.C.S.E.	261
Johore. By Harry Lake, Engineer in the Service of the Sultan	281
Recent Contributions to Oceanography. By H. N. Dickson, F.R.S.E.	302
Count Széchenyi's Travels in Eastern Asia. By Baron F. von Richthofen	311
The Pampas. By P. Kropotkin	318
Dr. Cvijić on the Phenomena of Limestone Regions	321
Northern Greece. By Dr. A. Philippson	323
The Kizil Irmak—the Ancient Halys. By Lieut. Märcker	327
The Monthly Record	329

THE SOCIETY
- The Oxford Geographical Studentship
- The Society's Prizes to English Training College Students

EUROPE
- Origin of the name Vienna
- The Area of France

ASIA
- Survey of Aden
- M. Potanin
- Coal in Siberia
- The Shilka River
- A New Map of China
- Botanical Exploration in Sikkim
- Changes of Level of Armenian Lakes

AFRICA
- M. Decle's Journey in Central Africa
- M. Foureau's Journey in the Sahara

AMERICA
- Mean Elevation of the United States
- Early Voyages on the North-western Coast of America
- Gold Mining in British Guiana

AUSTRALASIA
- The Elder Exploring Expedition in Australia
- The Chillagoe Caves, Queensland

POLAR REGIONS
- New American Arctic Expedition
- Antarctic Whaling Cruises

MATHEMATICAL AND PHYSICAL GEOGRAPHY
- Sea-temperature round Scotland

GENERAL
- Death of Von Middendorff
- The Work and the Awards of the Russian Geographical Society
- French Geographical Congress at Lyons
- Rylands on Ptolemy

Correspondence—The Height of Peak Godwin Austen, of the Karakoram Himalayas. By General J. T. Walker, C.B., F.R.S.	339
Obituary—Sir Harry Verney, Bart. General Saunders Abbott. By Major Broadfoot, R.E.	340
Meetings of the Royal Geographical Society, Session 1893-94	342
Geographical Literature of the Month	343
New Maps	353

MAPS AND ILLUSTRATIONS.

Grass Hillocks at Silfrastathir on the Fijerathsvathn	263
Sinter-fringed Bowl of Hot Spring in the Geysir Group	265
Sinter Terraces formed by the Overflow of Blesi, close to the Great Geysir	266
View of Eyriksjökull from West, taken at a Distance of Nine Miles	268
Glacial Drift Hills near Hnausar, called Vatnsdalsholar	272
View of Eyjafjord and Delta of Eyjafjarthará, taken from Vathlaheithi, at an Altitude of 1500 Feet	274
Some Craters of the Hljóthaklettar Group	277
View of Hverfjall from North-west	278
Interior of the Crater Hverfjall, with Mound and Ridge in Central Plain	278
Table of Average Frequency of Sargasso Weed in the North Atlantic	303
Surface Currents, June and July, 1893	310
Map of Iceland	356
Map of the Johore Territory, 1893. Surveyed and compiled by H. Lake	356

Sold by

PARIS: Barrère.
VIENNA: Artaria & Co.
HAMBURG: L. Friederichsen & Co.
ST. PETERSBURG: Watkins & Co.
MANCHESTER: John Heywood.
EDINBURGH: Douglas & Foulis.
DUBLIN: Hodges, Foster & Co.
BERLIN: D. Reimer.
LEIPZIG: F. A. Brockhaus.
NEW YORK: Scribner & Sons.
MELBOURNE: E. A. Petherick & Co.

For List of Council and Officers, Conditions of Admission to the Fellowship of the Society, and Society Notices, see pages ii. and iv.

ROYAL GEOGRAPHICAL SOCIETY.

PATRON.

HER MAJESTY THE QUEEN.

VICE-PATRON.

HIS ROYAL HIGHNESS THE PRINCE OF WALES, K.G., K.T., K.P., G.C.B., &c., &c.

Honorary-President.

HIS ROYAL HIGHNESS THE DUKE OF EDINBURGH, K.G., K.T., G.C.S.I., &c., &c.

COUNCIL.

(ELECTED 29TH MAY, 1893.)

President—CLEMENTS R. MARKHAM, C.B., F.R.S., F.S.A.

Vice-Presidents.

HON. G. C. BRODRICK.
Sir JOSEPH HOOKER, K.C.S.I., C.B., F.R.S.
Sir JOHN KIRK, K.C.B., G.C.M.G., F.R.S.
W. T. BLANFORD, LL.D, F.R.S., F.G.S.
General R. STRACHEY, R.E., C.S.I., F.R.S.
Captain W. J. L. WHARTON, R.N., F.R.S.

Treasurer—EDWARD L. SOMERS COCKS.

Trustees—Right Hon. LORD ABERDARE, G.C.B., F.R.S.; Right Hon. Sir JOHN LUBBOCK, Bart., F.R.S., M.P.

Secretaries—DOUGLAS W. FRESHFIELD; H. SEEBOHM, F.L.S.

Foreign Secretary—

Members of Council.

Admiral LINDESAY BRINE.
Hon. G. N. CURZON, M.P.
Lieut.-Colonel JAS. CECIL DALTON, R.A.
Major LEONARD DARWIN, R.E., M.P.
FRANCIS GALTON, F.R.S.
Sir GEORGE D. TAUBMAN GOLDIE, K.C.M.G.
Major-Gen. Sir F. J. GOLDSMID, K.C.S.I., C.B.
General Sir T. E. GORDON, C.B., K.C.S.I.
WILFRED HUDLESTON, F.R.S., F.G.S.
General Sir W. DRUMMOND JERVOIS, G.C.M.G., C.B.
J. K. LAUGHTON.
GEO. SUTHERLAND MACKENZIE.
E. DELMAR MORGAN.
JOHN MURRAY.
ERNEST G. RAVENSTEIN.
Sir RAWSON W. RAWSON, K.C.M.G., C.B.
HOWARD SAUNDERS, F.L.S., F.Z.S.
Colonel H. C. B. TANNER.
General J. T. WALKER, R.E., C.B., F.R.S.
Colonel C. M. WATSON, R.E., C.M.G.
Major-Gen. Sir CHARLES W. WILSON, R.E., K.C.B., K.C.M.G., F.R.S.

Assistant Secretary and Editor of Transactions—J. SCOTT KELTIE.

Librarian—H. R. MILL, D.Sc.

Map Curator.
JOHN COLES, F.R.A.S.

Chief Clerk.
S. J. EVIS.

Bankers—Messrs. COCKS, BIDDULPH, and Co., 43, Charing Cross.

Candidates for admission into the Society must be proposed and seconded by Fellows, and it is necessary that the description and residence of such Candidates should be clearly stated on their Certificates.

It is provided by Chapter IV., § 1, of the Regulations, that,

"Every Ordinary Fellow shall, on his election, be required to pay £5 as his admission fee, and "£2 as his first annual subscription, or he may compound, either at his entrance by one payment of "£35, or at any subsequent period on the following basis:—

Fellows of 20 years' standing and over	...	...	£12	10s.
„ 15 „ „ and under 20...		...	£16	
„ 10 „ „ „ 15...		...	£20	

"And no Fellow shall be entitled to vote or to enjoy any other privilege of the Society so long as "he shall continue in arrear."

All Subscriptions are payable in advance, on the 1st of January in each year.

The privileges of a Fellow include admission (with one Friend) to all ordinary Meetings of the Society, and the use of the Library and Map-room. Each Fellow is also entitled to receive a copy of **The Geographical Journal** and the **Supplementary Papers**, the former of which is forwarded, free of expense, to addresses in the United Kingdom, and the latter obtained on application at the Society's office.

Copies of the Regulations and Candidates' Certificates may be had on application at the Society's Office, 1, Savile Row, London, W.

The
Geographical Journal.

No. 4. APRIL, 1894. Vol. III.

ACROSS ICELAND.

By KARL GROSSMANN, M.D., F.R.C.S.E.*

It may appear, at first glance, a superfluous task to lay before this Society an account of a journey in Iceland, comprising, as it does to a great extent, ground that has been traversed before. Accounts of Icelandic travelling are by no means scanty; indeed, it almost looks as though a visit to Iceland is necessarily followed by a more or less violent attack of the *furor scribendi*, a complaint from which usually not even those escape who—as Sir Richard Burton somewhat disrespectfully expresses it—have only "done the cockney trip to the Geysirs," and possibly to Hekla. If in spite of this I think it worth while to bring forward my own experiences, I am led by the following considerations.

First of all, the abundance of interesting physiographical features which Iceland presents is surprising. These are, however, not always accessible, and even the most careful and able observer may miss what another traveller can hardly fail to notice without any effort under more favourable conditions. A great deal has to be left to chance, and under this chapter the weather plays an important part. You may plan a route, with every detail carefully thought out beforehand, and if that one factor, the weather, be unfavourable, you may find yourself taking a direction almost opposite to the one originally arranged. Large tracts of the country may be covered by snow, rivers may be unfordable, heithies turned into bogs, no grass may be found for the horses, clouds may hide the mountains, fogs cover the plateaux; all these obstacles, and others

* Paper read at the Royal Geographical Society, January 29, 1894. Map, p. 356. Figs. 4, 5, 8, and 9 are given by kind permission of the editor of the *Glacialists' Magazine*.

besides, may prevent a satisfactory survey of the parts through which your journey leads you. Hence it is not difficult to see why our knowledge of Iceland is still very fragmentary.

Furthermore, good pictorial representations of Iceland are not plentiful. Any one who examines the illustrated publications on Iceland will find them to contain either very few illustrations, or very incorrect ones, or reproductions of old time-honoured woodcuts, often copied secondhand, and mostly without acknowledgment. Under these circumstances, I think any real addition to our knowledge of Iceland will be welcome.

As for the physical features, there is, to my mind, no better mode at our disposal for taking down notes than photography. True, it cannot always be used, it is not even always unbiassed; but, wherever applicable, we have in it a means of recording an almost unlimited amount of detail with complete accuracy.

It has, therefore, been my endeavour to note down any observations in Iceland, as far as possible, through the medium of the camera, and in spite of very adverse circumstances the result has been thoroughly satisfactory.

The journey which I undertook in company with Dr. Cahnheim, of Dresden, who had visited Iceland three years previously, was signalized by an almost unprecedented spell of bad weather. Of that vaunted clearness of atmosphere, so deceptive with regard to the estimation of distances, I saw nothing; on the contrary, I doubt whether an English summer landscape is often veiled in a bluish haze such as constantly enshrouded Icelandic scenery while we were there. Moreover, the temperature was truly arctic. From my companion's previous experience, and from all known accounts, we had prepared ourselves for a pleasant summer temperature, somewhat like that of the Scottish Highlands. In reality we found an everlasting north wind, opposing our progress northwards with unrelenting force for three weeks, chilling us to the bone, once actually compelling us to stop for three days in the wretched though hospitable farm of Stathir, on the Hrútafjörthur. On our way back the wind changed, and, though warmer, still with equal ferocity blew into our faces; once to such a degree that we could not put up our tent, and had no other choice but to urge on our poor horses for twenty-one hours at a stretch.

On June 13, 1892, our steamer came in sight of the Vestmannaeyjar, and landed some passengers at Heimaey, the largest of this cluster of islets, the only one with a settlement; the others are inhabited by numberless sea-birds, and give pasture to sheep.

Although so late as June, the signs of spring had not appeared in Iceland when we arrived at Reykjavík (June 14). The country was in a deplorable state. There was hardly any grass out yet, and the prospects for a journey across country were very depressing. The sun,

very powerful in fine weather, was hidden by heavy clouds which veiled even the lowest hills; of the mountain Esja nothing could be detected, and, although there was no night, neither was there any real bright day.

One particular feature struck me from the first day when we visited the nesting eider duck on the little isle of Engey, opposite Reykjavík—I mean the peculiar hillocks which are seen in Iceland wherever grass grows to any extent (Fig. 1). These mounds have a height of between 1 and 2 feet, and are usually covered by the best grass. Such parts are naturally selected as farmsteads; hence almost all the farms are surrounded by an area studded with low hillocks, over which walking is

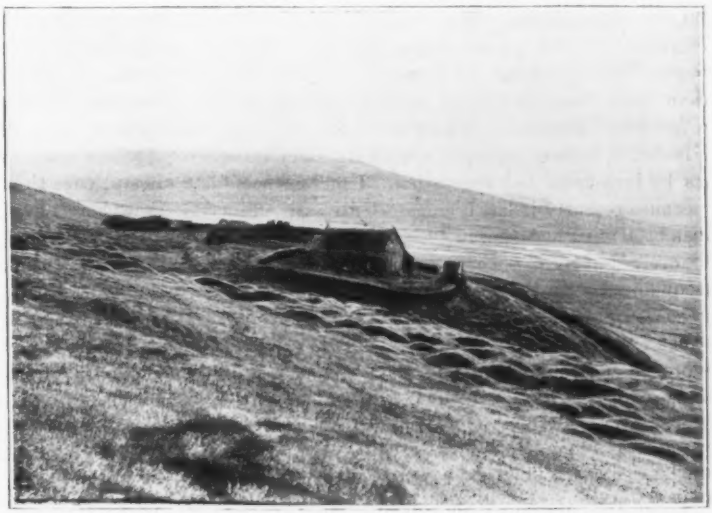


FIG. 1.—GRASS HILLOCKS AT SILFRASTATHIR ON THE FIJERATHSVATHN.

as fatiguing as riding is dangerous. The Icelanders, unpractical beyond conception, never dream of levelling these mounds; when ready, the grass can only be cut with a sickle.

In looking out for the solution of this peculiar phenomenon, an explanation soon suggested itself when we entered the Almannagjá. The snow, remaining longer than usual that year at the bottom of the rift, showed on its surface innumerable little conical hills of dark windblown sand, from half an inch to six inches in height. Their mode of origin by the melting of the snow in the heat of the sun is obvious. These sand-cones on the snow are frequently met with in Iceland, and have been described by previous travellers. Their relationship to the ubiquitous lawn-covered mounds, however, has not been pointed out clearly as far

as I could make out. After the formation of the sand-cones on the snow, vegetation takes hold of the loose soil, binds it together, and the form of the future lawn mound is perpetuated.

I think the cause of the great frequency of these sand-cones on the snow must be looked for in the low temperature of the air. The melting of the snow is due more to the direct impact of the solar rays than to conduction from the air around. It is for this reason that we do not find these sand-cones in our own latitudes. We find them, however, in the Alps, where the climate and average temperature resemble those of high latitudes, and where the force of direct solar radiation is strong in a thin, clear atmosphere.

The roads to Thingvellir and to the Geysirs are sufficiently well known to be omitted here. Suffice it to say that both traverse districts showing distinct glacial striæ (*not* the "signs or markings of snow water," but of ice-carried stones). My observations referring to glaciation have been published in the September (1893) number of the *Glacialists' Magazine*. I may mention here that the traces of ancient glaciation were everywhere apparent on our track, except where covered as by lava-flows and vegetation. I find it necessary to emphasize this, because recently it has been asserted in all seriousness that there never has been any glaciation in Iceland. Such a conclusion could not possibly be arrived at by any one who has either seen the country for himself or is acquainted with the literature of the subject. Glacial traces have been recorded almost over the whole extent of Iceland, and my own observations form a contribution which helps to complete the evidence already noted down so plentifully. It may be objected that these traces are only signs of "local" glaciers. But when we find "local" signs *everywhere*, we usually call them "general."

Of the Almannagjá, of the famous Althíng, and of the lake of Thingvellir, Lord Dufferin, who was completely fascinated, and Sir Richard Burton, who was disappointed, have given such graphic accounts, that I need not dwell at length on their appearance.

A very instructive exposure is given in the Almannagjá, showing the different layers of lava as they have flowed one above the other to form the large lava plain whose subsidence afterwards caused the two large rifts (Almannagjá and Hrafnajá) and the countless minor ones of the Althíng plain. The uppermost of these layers has been greatly demolished by weathering, and is only represented in its former height by a few large pinnacles. No artifical exposure could have been more perfect. The top of each layer is marked by very small columns; below these the columns are thicker, and at the base they are thicker still. This is not the rule with all lava-flows. Usually, the upper and lower parts consist of small columns, and the middle portion of thicker ones. Probably, the flows took place at short intervals, and so the earlier ones had not cooled down sufficiently to cause sudden chilling of those that succeeded.

The scenic beauty of the Almannagjá is greatly enhanced by the upper and lower falls of the Œxará. At the upper fall the river leaps into the rift, follows it for a short distance, and emerges at the lower part, to form a little further on the Thingvallavatn, the biggest lake in Iceland. It is difficult to tear oneself away from this spot, interesting alike from a geological and from an historical point of view.

Our road leads us to the Geysirs. We were not fortunate enough to witness a spontaneous eruption. Although we waited three days, the Great Geysir kept quiet. The Strokkr was fed as a matter of course, and gave a beautiful explosion, about 100 feet high; rain and dark sky unhappily prevented a photographic record of the magnificent

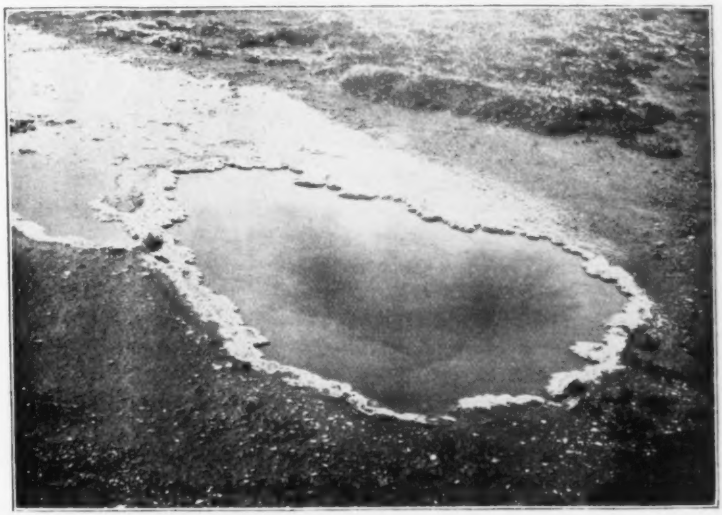


FIG. 2.—SINTER-FRINGED BOWL OF HOT SPRING IN THE GEYSIR GROUP.

display. In the Appendix the measurements and temperatures of the principal springs are given, so as to enable future observations to be compared with them.

The smell of sulphuretted hydrogen is very strong; it seems to be very unequally distributed amongst the different springs. "Blesi" is apparently free from H_2S. When the thermometer was taken out of Strokkr, the metal cover was completely blackened, while in the tube of the Great Geysir it had remained untarnished. It was found that the temperature at 22 meters depth in the tube of the Great Geysir was sufficient to fuse completely the solder with which I had closed the ring at the upper end of the thermometer. Happily, it had been securely

fastened by several loops, or else it would have been lost. It is impossible to describe the exquisite beauty of some of these springs with their marvellous transparent blue-greenish water; only a faint idea of them can be given by a photograph (Figs. 2 and 3).

From the Geysir it is only a couple of hours' ride to the Gullfoss, probably the fullest of Icelandic waterfalls. In a broad cascade the opaque waters of the Hvítá slide down between narrowing walls of basalt until they reach a bend where they suddenly leap into a chasm 80 feet deep.

The state of the country made progress directly north from Haukadalr impossible, so we had to return to Thingvellir. In fine weather

FIG. 3.—SINTER TERRACES FORMED BY THE OVERFLOW OF BLESI, CLOSE TO THE GREAT GEYSIR. THE SINTER IS PALE PINK IN COLOUR.

there can be scarcely a more delightful sensation than that of riding through scenery such as this, so well known to most Icelandic travellers. The dwarf birch has a fragrance which I have never found anywhere else; legions of large grey moths flit about in the balmy air; the sun sends down his warming rays; and in the distance the snowy head of Hekla and the Southern Jöklar stand out from the blue sky. Alas! this delicious picture soon vanished, never to return for the rest of our journey.

The typical Icelandic "forest," skogar, is formed by fragrant dwarf birches, shrubs of about 3 to 4 feet high. Equally peculiar is an ordinary Icelandic road. It is nothing but a rut cut by the feet of the

countless generations of ponies which have been driven along in this direction. These ruts are deep, usually very narrow, and if the luckless rider is endowed with fairly long legs, the riding resembles more a performance on a bicycle than anything else. Often the ruts branch off sideways, and with a jerk the pony may bolt into the branch, when it is difficult to keep in the saddle.

From Thingvellir we take the track called Hofmannaflötr. A glance backwards shows the lake in the distance. At Brunnar, a deserted spot, we see the ice-covered Armannsfell, and to the right we have now the beautiful volcano Skjaldbreith, about which more presently. On we speed, the north wind (truly arctic) well-nigh blocks our progress through the Kaldidalur, a high pass between the vast inland glaciers. As we ascend, the temperature gradually falls, the rain turns into sleet, the sleet into needles of ice, and the storm rages so furiously that our horses can hardly make any headway at all over the vast expanse of sloppy snow, into which they sink often over their knees. The thermometer shows +0·5° C. (33° Fahr.). After five hours of hardest experience, we emerge from the clouds and descend to the silvery band of the Northern Hvítá at our feet, which we reach after another hour; then through the icy waters of the river and over a desolate lava-field, until at last the hospitable though expensive farm Kalmanstúnga gives us shelter. So desolate was the route traversed that day, that the only signs of life we found in the Kaldidalr were, as my companion expressed it, one bird and one dead moth.

I mentioned Skjaldbreith before. This beautiful volcano, only about 2500 feet high, covers an area of nearly 30 square miles. It is of perfect regularity, a very obtuse cone, the inclination varying between 8° and 9° on the different sides, resembling in this respect the Hawaian volcanoes. So regular is its outline that it would seem to be easy enough to ride to the top, provided there are no rents of any great width to cross. The top is, however, ice-capped all the year round, and a ride up would probably give no information. Skjaldbreith gives us the key to a number of snowy cupolas in this district. First amongst them for its exquisite regularity is the ice-dome of Ok. Hidden from our eyes by fog and clouds were those two snowy cupolas which Messrs. Preyer and Zirkel describe so graphically (in 1860), the snowy breasts of a young giantess turned into stone, according to an Icelandic legend. We find them again as "Sheba's breasts" in Rider Haggard's novel, 'King Solomon's Mines.' There is, further, the western termination of the Lángjökull, the Geitlandsjökull, showing the same beautiful curve; and also the impressive Eyríksjökull (Fig. 4). (I have pointed out in the notes on Glaciation how this profile of the Eyríksjökull speaks in favour of a south-north direction of an ancient glacier covering the Eyríksjökull completely). This massive mountain, covering an area of over 30 square miles, stands like an outpost by the large Lángjökull. It is an old volcano, and is

probably responsible for the lava-field which stretches to the south-west, skirting the Strútr, on the southern slope of which Kalmanstúnga is situated. The ridge above the farm is strewn with a stratified ash. The lava, like that of Thingvellir, is mostly ropy. The surface is often covered with a green or brownish glaze of tachylitic nature. Often there are hollow spaces underneath the surface, and then the hoof of the horse striking it produces a peculiar musical sound.

These lava-fields are always very trying to the horses, and often exceedingly dangerous. Their general appearance varies much, but it always reminded me of the sea. Sometimes they are quite flat, with or without small ripples on the surface; sometimes you see beautiful undulations of wave crests and hollows, like an ocean swell; sometimes you find a regular choppy sea, and occasionally the forms of pack-ice left in a mad chaotic struggle, and sticking up when consolidation overtook these destructive streams.

FIG. 4.—VIEW OF EYRÍKSJÖKULL FROM WEST, TAKEN AT A DISTANCE OF 9 MILES.

The lava north of Kalmanstúnga must have been of great viscosity, as shown by the ropy surface and its curves. The large wave mounts are usually cracked, and resemble the broken crust of a pie. The fissures, caused by the cooling of the lava, form one of the greatest obstacles to the progress of the horses; often they are treacherously hidden by a covering of grey moss, of almost the same colour as the lava itself. They show generally a very well-marked columnar structure, perpendicular to the surface of the flow.

A small stone cairn marks the entrance to Surtshellir,* a roundish opening of about 50 feet in diameter, filled very irregularly with big lava blocks, and covered with large masses of snow, reaching deep down into the cave itself. The description of Surtshellir has been given so well by Olafsen and Povelsen, by Henderson and by Preyer and Zirkel, that I shall confine myself to a few remarks concerning the most distant parts. After twice emerging into daylight from exceedingly fatiguing scrambles for more than 4000 feet underground, over big lava blocks piled up in chaotic disorder, we plunged for the third time down on the steep snow incline into the pitch-dark hole before us. Soon the snow

* Surtshèllir: *Surtr*, a troll or giant, means "black" = schwarz (German); swarthy, in English; *hellir* = hollow = höhle (German); κοῖλος, in Greek; coelum, in Latin.

ceased, and after a few paces we came on solid ice, flooded with several inches of water, through which we had to wade. The ground was exceedingly slippery; handicapped and laden as we were, we could hardly keep our balance, candles in hand, especially when, after a few feet of rise, the ice-coated ground began to slide downwards. But only a few steps more, and we were rewarded by one of the most enchanting sights it had ever been my good fortune to behold. Out of the floor, uneven, slippery, and more and more slanting, there seemed to rise ahead of us a number of fantastic forms, standing out pale in the uncertain light from the ice floor. On approaching with the candles, we recognized in these pale mushroom-like forms the most gorgeous ice stalagmites, of varying sizes and shapes, scattered all over the slanting floor of the cave, from the densest white to a pale blue of ghost-like transparency. Some were solitary, others formed a cluster; some, in the style of a Gothic spire, were surrounded by a tier of secondary spires, while others, almost mathematically perfect in shape, formed isolated transparent paraboloids.

On the north-western wall of the cave (the main direction of the whole cavern runs from north-north-east to south-south-west) there was a magnificent curtain of long ice-stalactites, forming a colonnade and partitioning off a corridor wide enough to allow us to walk along with a lighted candle. Where stalactites and stalagmites had met, somewhere near the middle of this colonnade, they resembled the face of an organ. (Photographs were taken under almost insuperable difficulties by magnesium flash, but form almost the best of the whole collection.) Add to this the thousandfold sparkling and glittering from those parts of wall and roof which were not draped by graceful icicles, and you will not wonder that we felt completely dazed, as if transported into the midst of a fairy tale of our childhood. (The brilliant sparkling effect, particularly impressive by flash-light, was produced by peculiar forms of ice-crystals which have been described separately in a paper placed before the Royal Society.) With difficulty we tore ourselves away from this enchanted spot. When, at last, we reached the glimmer of daylight, the exit of the cave gave a charming effect. The temperature in the cave and outside on our way back to Kalmanstúnga was $+0{\cdot}5^{\circ}$ C. (33° Fahr.).

Four weeks later the adverse state of the weather and of the country brought us once more near the caves. On a ride so severe and fatiguing that it stood out as the worst from all our other severe experience, we came from the north in feverish haste to catch our steamer at Reykjavík. So wild was the storm when we reached the Fiskivötn (fish lakes), that no tent could be erected. Before us rose the massive Eyríksjökull, its snowy head covered by heavy clouds, which the mad south-westerly storm tore into long streamers. In lurid tints appeared the tongues of the descending glacier, the storm raging against us, we racing on at full speed; before us, in majestic repose, the enormous mountain. At a

distance of ten miles from the mountain a photograph was taken, while I had to sit on the camera to steady it against the violence of the storm (8 p.m.).

After five hours' further ride, the entrance to Surtshellir was reached, and a descent was made, this time in quest of the coins which had been deposited on a stone block in the remotest recess by Olafsen and Povelsen in 1753, and by Henderson in 1815. I knew of them through the allusion of Preyer and Zirkel, who had failed to find them in 1860.* Fatigued in the extreme, after a nineteen hours' ride, we succeeded at last in finding the tin plate with the coins on a piece of wooden board, on the top of a big block of lava. The water dropping occasionally from the ceiling had cemented some of the coins with a sort of sinter to the plate. Some coins had old seals hardly recognizable, others were more recently placed there. I took two of the oldest coins, both with seals (exhibited). The one is probably from Henderson, to judge from the seal which represented a sitting figure of Christ and some Hebrew lettering; the other is of the year 1668, probably one of the Olafsen coins of 1753. Although I exchanged these coins for their equivalent in modern kroner, I shall not feel satisfied until I have restored them to their old resting-place in Iceland, in the course of a year or two.

And now back to our journey.

From Kalmanstúnga we went to Reykholt, famous as the seat of Iceland's greatest son, Snorri Sturluson, who was murdered there in 1241 by his own son-in-law. Well preserved up to this day is the Snorralaug, or Snorris' bath, a circular basin about 12 feet in diameter, 4 feet deep, and lined with stones. Four stone steps lead into the bath, which is filled with warm water from one of the hot springs some 200 yards distant by a primitive stone channel. An overflow keeps the depth about 2½ feet. On the morning of June 30, the temperature of the water was 46·5° C. If the temperature is required lower, the supply is stopped temporarily, and the water allowed to cool to the desired degree. There are several springs close together, about 200 yards east of the bath, which is supplied by the principal spring. This latter boils up in a continuous jet 1 to 2 feet high. The thermometer would not sink beyond 1 foot below the surface, and showed 98·5° C. Close by is a small boiling jet, quite shallow (89° C.), and not very far another spring, with a large and shallow circular mud bowl. It does not rise; the temperature was 98° C. All these springs have a strong smell of sulphuretted hydrogen.

The next day we continued our journey down the Reykholtsdalrt, which is very rich in hot springs, as indicated by its name. The most

* "On we went, hoping to find the coins which Henderson deposited in 1815 on a small stone heap. After a short scramble over sloppy and gently sloping ground, we actually found the stone pyramid, but not the slightest trace could be detected of coins or seals" (Preyer and Zirkel, 'Reise nach Island,' p. 104).

curious of these are the two Geysirs in the river itself. In the midst of the river-bed a rock of siliceous sinter rises about 18 feet long, 6 feet wide, and 5 to 6 feet high; at each end a hot spring spouts. The southernmost is the smaller, both in volume and height; it only springs up to 6 inches. The thermometer descended to a depth of 2 meters, and showed 100·5° C.

The other spring, on the northern end of the sinter block, rises 2 to 3 feet high, but could only be measured 1 foot below the orifice (99° C.), where the cap of the thermometer was caught and had to be left behind.

On turning northwards we had to search for a ford in the Northern Hvítá. Through all our journey the rivers were in a very plethoric condition, while our horses were the opposite; crossing a broad, deep river of opaque whitish water, with the banks constantly changing, was therefore a serious undertaking. Our guides first rode to a flat island in the river; there they drove two of the spare horses into the stream. One of them found a ford, the other had to fight hard against the stream by swimming. The ford having been found, the caravan was divided into three parts; the horses were tied together, the tail of one to the head of the next, in batches of six or seven, and then led by one of the men across the stream. This ensures their following in the same track, an important point when wetting the luggage had to be avoided.

The Icelandic horses are as good natured as they are invaluable. How they can go on carrying the primitive pack boxes on the still more primitive pack-saddle is a mystery to me. They will stand anything, do almost anything, but they will avoid going over a bridge if they possibly can. Once we had to cross a deep cutting near a farm; a few planks covered with soil were placed across. Some of our horses were driven to this bridge, and hesitated until urged on, when two of them at last rushed on to it abreast. The boxes sticking out on both sides clashed together, and the impetus was such that both animals were thrown from the bridge, one on each side, and disappeared below. Strange to say, no lasting injury followed this peculiar display of equine gymnastics, except a few scratches on horses and boxes. Henceforth our horses were allowed to have their own way as far as possible.

North of the Hvítá the basalt is rich in amygdules and zeolites. The basalt of the Grjóthals is smoothed by glaciation, while the pyramidal Baula is split up into very regular columns. We rested at Hvammur. The desolate Holtavörthuheithi was veiled from our view by fogs and storm; descending, we saw the first wild swans, a white fox, and ptarmigans. In pouring rain we passed a fine vertical basaltic dyke denuded by a brook which had breached it; the hexagonal ends formed a design of geometrical regularity. Two hours later we scaled with an effort the incline on which stand the farm and "post-office" of Stathir, our destination for that day. For two days the storms kept us prisoners in Stathir. When at last we proceeded we found a good amount of drift-

wood thrown on the shore of the Hrútafjörthur. After a visit to the amiable merchant and his wife at Bortheyri, we went north-east, *viâ* Melstathir, past the Midhóp, and crossed the remarkable hills near Hnausar, the Vatnsdalsholar (Fig. 5) which I have described in the *Glacialists' Magazine*. In this part we found the only yellow poppies (*Papaver nudicaule*) we saw during our journey. Very few flowers were seen altogether in that year most abundant were the lovely cushions of *Silene acaulis*, from pale mauve to pink and almost crimson; *Dryas octopetala*; *Caltha palustris* of gigantic size; *Geranium montana*; but not a single gentian in blossom.

Turning to south-east, the cone of Reykjanybba rose before us like a volcano in outline. The farm Reykir is situated at its foot on the north side; its north-east flank has a fine example of a glacial "boss," reaching down almost to the level of the long narrow Svinavatn. At Reykir there is a hot spring, mounted on an artificial basin of stone, oval in shape, 10 feet long, 7 feet wide, 1 to 2 feet deep. Temperature

FIG. 5.—GLACIAL DRIFT HILLS NEAR HNAUSAR, CALLED VATNSDALSHOLAR.

53·5° C. At the lake we met for the first time with little flies, not very troublesome, nor very numerous.

The rivers Svartá and Blandá, both swift and deep, had to be crossed; they have the characteristic appearance of an Icelandic river in an upland valley. In the farm of Bolstatharhlith we found one of those beds peculiar to Iceland, which can be made longer or shorter to suit the anatomy of everybody. When not in use they are telescoped together like a table, thus economizing space. The sagacity of Icelandic road-makers is shown by a "road" leading straight over a very fine hemispherical glacial mound near Vithimyri, where it would have been much easier to circumvent it horizontally. When coming to the river Herathsvatn we found fording impossible, and had to take the "ferry." This title is in Iceland applied to a leaky boat that can be rowed across a river by one man while another bales out the water as fast as he can. When the luggage and the travellers have reached the other side, the horses are driven into the stream and have to swim across, no easy task

in the swift current. We nearly lost one of our best riding-horses, which had to be rescued by the timely help of the boat. While we were waiting on the shore for the horses, we saw close to us three seals rising repeatedly out of the river, first going up and then down stream. As soon as the horses had reached the shore they threw themselves on the ground, as usual, and rolled their backs in the sand. What objects of art they looked may be readily imagined when I add that their winter coats, nearly three inches long, had come off in patches only, leaving underneath a short summer coat. From my own experience I never saw the horses "groomed" or "cleaned" in any other way than that just described.

In Silfrastathir a very fine hand quorn for grinding corn attracted my attention; it was, however, too heavy to be brought away. Entering the Œxnadalur, we came to some of the most picturesque mountain scenery in Iceland; a fine valley opens on the south side. Backasel is a typical farm, the interior showing the arrangement of beds, like berths in a ship. To procure more privacy, a cord is put up and a curtain hung in front of the berth which is occupied by two or more people. All the inhabitants of the farm sleep in the same room for the sake of warmth.

At the farm Steinstathir, an ancient wooden hand-mangle was procured; these "trafakefli" have not been in use for the last 200 years. When entering the Eyjafjörthur we rode over endless *roches moutonnées*, until we reached Akureyri. Akureyri prides itself more on possessing the biggest trees of the island than on anything else. It is a flourishing settlement of about 500 inhabitants in the picturesque Eyjafjörthur. The trees are a few healthy-looking but small specimens of *Sorbus aucuparia* (rowan tree).

Leaving Akureyri, we crossed the fjord on horseback, the ebb being favourable. It is an experience of its own to ford for more than half an hour that long inlet of the Polar Sea. The Eyjafjarthará forms a very fine alluvial delta, the channels and banks of which are continued below the surface of the water for a certain distance into the fjord. When riding across the fjord the horse has to take these channels and banks alternately, being often only knee-deep in the water, often up to the shoulders. Where the water is shallow, he splashes with legs and knees, and progress, if hardly visible in the vast expanse of the fjord, is at least audible. But as soon as any of the channels are reached, the horse sinks down to the shoulders, the splashing of his legs ceases, not a sound is heard, and the deadly silence has something strangely uncanny about it.

The steep incline of the eastern shore was afterwards scaled—a height of over 2000 feet—and revealed a magnificent view of the delta and the fjord (Fig. 6). On our descent through the Vathlaheithi we found ptarmigans plentiful. Attracted by the rattling noise of the

FIG. 6.—VIEW OF EYJAFJORD AND DELTA OF EYJAFJARTHARÁ, TAKEN FROM VATHLAHEITHI, AT AN ALTITUDE OF 1500 FEET.

mother, I repeatedly noticed the young birds almost under the hoofs of our horses. Not able to fly yet, they were caught easily with our hands, but were soon restored to the caresses of their anxious parents.

The river Fnjoská is not broad, but swift and dangerous, owing to the large boulders it carries along. The rate at which some of these streams flow is often astonishing. On our way homewards I was struck by the furious pace at which the swollen Hèrathsvatn raced past Silfrastathir. I measured the velocity in different parts, and found it varying from 3 to 5 meters per second. This was probably exceptional, and due to the great amount of rain during the preceding fortnight.

Beyond Háls we saw a gigantic striated boulder. Evidences of glacial action abound in this part, except where recent lava streams have obliterated them. This has been partly the case at Ljósavatn, although the hill-slope towards the east shows very fine perched rocks standing out against the sky. Half an hour east from Ljósavatn the impressive Gothafoss is formed by the leap which the Skjálfandafljót takes into a broad rent in the post-glacial lava. Here the greater number of bridges of the island are crowded into a small area; the roads too are partly very good, almost fit for a wheeled vehicle. At a very poor farm we were consulted medically, and while my companion attended to the patient I took a view of the picturesque exterior of the building.

When riding past the churchyard of Grenjatharstathir we saw three basaltic columns lying on tombs. All three were very perfectly regular six-sided prisms, and were placed in a west-east direction on the grass. One stone had runic inscriptions on the three upper sides—the only runes we saw in Iceland; the second stone showed a much weathered inscription on the uppermost side only, in Latin characters; the third had no recognizable inscription at all. When the wooden handle of my hammer touched one of the columns by accident, a ringing musical sound was produced, varying in height on the different faces of the same column.

Stone I.—Length, 129 cm.; greatest diameter, 19 cm. The three upper surfaces have runes, which we photographed. When struck with the knuckle of the middle finger an almost singing sound is produced. On the largest southern and northern (opposite) faces that note was as determined with the little tuning-fork which I always carry with me; the upper and the adjoining northern face give a note a third higher,

Stone II.—Length, 150 cm.; greatest diameter, 21 cm. When struck, the upper and adjoining southern faces emit the note , while the upper northern and the opposite face ring a clear

The inscription on the upper surface is badly weathered; a photograph would not have shown anything, and a rubbing was therefore taken with

a bit of cloth coloured by some iron-stained amygdules. With great difficulty I deciphered the following:—

"HIER + HVILER + I + DROTTNI + THORGRIMVR + HE . . 'SSON."

("Hier hviler i drottni thorgrimur he . . 'sson.")

(*i.e.* "Here rests in the Lord Thorgrimur He . . 'sson.")

Stone III.—Length, 133 cm.; greatest diameter, 19 cm. No inscription. When struck, the upper northern face emits the note , the upper southern face , while the narrow top (face between the others) gives a note between *c* and *b*, full of interference jerks.

(Mr. S. B. Gould gives on p. 194 of his book, 'Iceland: its Scenes and Sagas,' a correct rendering of the runes of *Stone I.*, taken by a "rubbing with a German sausage," as he amusingly says. For the copying and translation of the inscription on *Stone II.*, however, we can hardly make that sausage responsible; it is thus given: "Hjer hvilir Idrottni Thurur . . . ." "Here sleeps Idrottni Th——'s daughter." Idrottni is not a name for a girl, but it means in Icelandic "in the Lord," and the inscription shows not "Thurur . . ." but "Thorgrimur He . . 'sson.")

A few hours north of Grenjatharstathir we see the steam rising in the distance, denoting the spot where the Uxahver or Northern Geysirs carry on a somewhat sluggish existence. There are three springs in all, the largest resembling the Great Geysir. Its circular bowl consists of siliceous sinter, and has a diameter of 30 feet; it does not spout often. As we were riding away we noticed the water rising in the centre for a moment, about 2 feet high only. The second spring is the most active; out of a bowl, 3 meters in diameter, it throws every five to ten minutes a jet of water to a small height, sometimes up to 4 meters, 3½ meters below the surface of the water the thermometer registered a temperature of 103° C. The third spring is comparatively insignificant, only a short distance to the south-east.

A small orchard has been placed close to the springs, and sheltered on the far side by a low turf wall; in the warm damp air potatoes thrive merrily.

The end of that day's journey brought us to Ásbýrgi, a rift, if not so well known as the Almannagjá, at least equally remarkable. From its parent rock a huge triangular wedge is separated by a perfectly flat depression, half a mile wide, V-shaped, each side of the V about a mile and a half in length. The rock rises perpendicularly to more than 300 feet, and is formed of many layers of a coarse doleritic lava, imitating with its vaulted flows the walls of a mediæval castle, with arches and windows. The rift is well sheltered from storms; we found near the apex of the V quite a respectable little birch forest, with trees of five to six yards in height—the tallest forest trees in the island. A good deal of snow and a dried-up pond at the end took the place of the "lake" which our guide had led us to expect.

Ásbýrgi was our most northern point reached on this journey. A day's ride brought us to the eastern limit, to that finest of all Icelandic and European waterfalls, the Dettifoss. The access to the fall, marked from afar by a white steam-cloud, leads over uneven, barren territory of pre- and post-glacial lava. With one tremendous bound the Jökulsa leaps into the largest of those volcanic rents which in this part of Iceland have a north and south direction. The rift is about 300 feet deep and 500 feet wide, and shows in its perpendicular walls four distinct layers of lava, with exquisite columnar structure. When Gunnlangson drew up his great map of Iceland in 1844, the Dettifoss was not known; on the later maps its position is variously given. When we were there, the white

FIG. 7.—SOME CRATERS OF THE HLJÓTHAKLETTAR GROUP.

cone of Herthubreith, at a distance of about 50 miles, and the mountain Eilífr became visible for a short time, enabling us to take the following compass bearings: Herthubreith, 215° magn.; Eilífr, 297° magn. Allowing 37° for westerly declination, this would give almost exactly the spot on Gunnlangson's map where the dotted boundary-line between the northern and southern Thíngeyjarsýsla cuts the Jökulsá.

Of intense interest between Ásbýrgi and the Dettifoss are the Hljóthaklettar (rocks of sound or echo). Thoroddsen * gives the following brief description (Fig. 7):—

"The so-called Hljóthaklettar are a series of steep basaltic peaks

* "Eine Lavawüste im Inners Islands," *Petermann's Mitth.*, 1885, ix. p. 331.

150 to 200 feet high, of the most curious forms. The basalt of these rocks is split up into small columns variously arranged, often in a semicircle round small openings. The cause of this irregular formation is erosion, which has washed out the palagonite breccia, while basaltic dykes remained; here and there some breccia is still found enclosed in hollows in the rock."

A closer study of some of the photographs of these remarkable rocks shows that this explanation is erroneous, or at least incomplete.

FIG. 8.—VIEW OF HVERFJALL FROM NORTH-WEST.

The rocks have been formed by a rather liquid lava. The columnar structure is certainly the finest I have ever seen, and is found in every one of the rocks where they show an exposure (denuded by erosion). The hollows, however, are so regularly spherical, and in one instance so large—about 100 yards across—that they cannot possibly be explained by the filling up of a space round a nucleus of palagonite

FIG. 9.—INTERIOR OF THE CRATER HVERFJALL, WITH MOUND AND RIDGE IN CENTRAL PLAIN.

breccia. These craters are evidently the same formation for which Dutton * proposed the name of "caldera." They are produced by lava basins which, having been tapped and drained at lower levels, have formed semicircular hollows by the aspiration of the stiffening but still fluid lava. The various sizes of these drainage hollows and channels can be seen in the different photographs taken. The columns are smallest near and perpendicular to the surface of the hollows, proving thereby that cooling began from these hollows, which were probably open spaces and had time to cool before a subsequent filling up with breccia took place. Afterwards the breccia has been weathered out, while the harder

* 'Hawaiian Volcanoes,' p. 105.

basalt has remained. That the basalt has not escaped erosion altogether is shown by various big upright rocks, and also by the circular crater or "caldera," of which the larger half is preserved, while about two-fifths have disappeared. It would be difficult to say how far the breaking down of these hard masses may have been hastened by earthquakes or similar violent shocks.

A few remarks only about the Mývatn. The beautiful crater Hverfjall (Figs. 8 and 9) and the unique phenomenon presented by its interior have been described by me *in extenso* in the November number of the *Glacialists' Magazine*. The steaming sulphur mountains, the mud geysirs, the desert, have been well described by previous travellers. The Hrafutinnuhryggur formed the subject of a special excursion, and enabled us to collect exquisite specimens of Obsidian.

From Mývatn we returned to Akureyri, expected by more than fifty people seeking medical and surgical advice, some of whom had come a long distance. Then followed our hurried ride across the country in order to catch our steamer at Reykjavik. Of the last 66 hours, we spent 44 in the saddle; but we had the satisfaction of arriving at Reykjavík just in time.

APPENDIX.

GEYSIRS. JUNE 20, 1892, 1 P.M.; BAROM. 29·575″ ENGL.

1. Great Geysir. Bowl (crater) oval, obliquely elliptical; diameter, west-north-west to east-north-east = 15·5 meters; north to south = 17·5. meters. Temperature at 22 meters depth., 123·5° C.

2. Blesi. Temperature 9 meters below surface, same as near surface = 94° C.; surface level with ground, overflowing.

3. Spring close to Blesi. Surface of water 2 meters below opening; thermometer reaches 6·5 meters, deep in water, and registers 101·5° C.

4. Steaming mud spring close to Blesi. Thermometer enters only 4 inches, and shows 95° C.

5. Strokkr. Surface of water 3 meters below opening; temperature in 10·5 meters of water, 108° C.

After the reading of the paper, the following discussion took place:—

Sir ARCHIBALD GEIKIE: At this late hour, and after such a pleasing excursion through Iceland, little room is left for comment or criticism. The photographs have given us a vivid picture of Icelandic scenery, and have brought out clearly some of the salient features of Icelandic geology. But I will not enter into any discussion on questions of scientific interest, though Dr. Grossmann has provided us with ample material for it. His pictures of the volcanic regions suggest many points on which we might ask for further information, and his illustrations of the peculiar topography of the island might be made the text for a long discourse. He did not himself enter into scientific problems, and his explanations of some of the superficial features might be open to question. It is remarkable to what an extent all over northern Europe such surface-features have given rise to legends of witches, warlocks, and giants. It would be interesting to know how far the

Icelandic topography has impressed the imagination of the race which has so long inhabited that region.

Sir HENRY HOWORTH: I should like to begin my remarks by emphasizing what has been said in praise, not only of the photographs, but also of the art with which a very great number of picturesque facts have been selected from a large number of observations by Dr. Grossmann. Of this very terribly barren land my old friend Vigfusson used to give a very graphic picture by saying that no man in Iceland was ever known to die in the same house in which he was born. Everything there is in a process of continual destruction by the elements. It s very hard on some of us who love fighting, and who have had a fight already with Dr. Grossmann elsewhere, that it is so late, because we might have had an interesting discussion to-night. One thing is remarkable in all these pictures, namely, the extremely recent-looking surface of this great island. There are reasons for believing that these great outflows of lava and basalt were not there at the beginning of our knowledge of this island. For 150 to 200 years after the island was settled, the volcanic phenomena were unknown altogether, and it was a great surprise to the Icelanders themselves when they began. Since then, and perhaps also in the ages long before then, the island has been overflowed in all directions by these great lava-currents, and the surface has been so dislocated that I am bound to say it is impossible to deduce great laws or important explanations from a visit of only five or six weeks. What our friend has done to-night is to present us with a chain of difficulties—a great chain of questions to be solved. They press upon us all the necessity of having a careful and deliberate examination of the problems of this island, such an exploration as that carried on in our island by the great institution over which Sir Archibald Geikie has presided during his four years' exploration of this country. There is no place where some of the more difficult problems of geology can be studied in the same way as here, where the soil has been removed from a large part of this island, and we can see the naked bones of the land. It seems to me that if we could be transplanted to the moon, we should see there, on a large and exaggerated scale, very much what we see here—large rifts, circular volcanoes, great fields and seas of lava, to be seen nowhere else on the face of the earth except in this island. The questions that arise are of every kind of interest, polemical and otherwise. A great point dividing some of us from the general views of Dr. Grossmann is whether the glaciation of Iceland was by local glaciers on the higher ground, or general glaciation of the whole island. One thing you will all agree with me in—namely, in thanking Dr. Grossmann for the excellent treat he has given us to-night.

Professor JUDD: At this late hour I shall be consulting the general wishes of this audience if I do no more than express in the shortest possible manner the sense of obligation we all feel to the author for taking us to Iceland for a short time, and in such a very pleasant manner. We must all have been struck with the photographs of this wonderful country that have been shown to us, and if we have not heard all we might have wished, yet our eyes have been feasted with such a display of the scenery of this wonderful country, that I think we shall all go home instructed and delighted with what the author of this admirable paper has placed before us, and look forward to the time when we shall be able to read the full descriptions of these scenes, the wild beauty of which we cannot fail to remember.

Dr. GROSSMANN: I will not detain you any longer, especially as a large number of Icelandic exhibits awaits your inspection in the reception-room. The time at my disposal has been very limited for a subject so full of interest as a journey in Iceland, and I could therefore select a few striking features only on which I should have liked to enter into a discussion. It has been my endeavour to lay

before you these facts as impartially as possible by means of photographic views, leaving it principally to you to draw your own conclusions.

As the time is too far advanced for any discussion, it only remains for me to thank you for the very kind reception you have given to my paper and to my illustrations.

Capt. Wharton (who occupied the chair): It only remains for me to thank Dr. Grossmann for the very pleasant evening he has given us, transporting us by means of his photographs to Iceland, and enabling us to realize the country in that way better than in any other.

The Map of Iceland.—This map is a reduction of Gunnlaugsson's survey of Iceland.

JOHORE.*

By HARRY LAKE, Engineer in the Service of the Sultan.

Johore territory occupies the most southerly portion of the Malay peninsula; it extends from Cape or Tangong Bulus in latitude 1° 16′ 12″ north to about 3° 1′ north.

On the north it is bounded by the protected native states of Pahang and the Negri Sembilan, and on the north-west by Malacca. A narrow strait, the "Selat Tebrau" of the Malays, separates the territory from the Island of Singapore. In former times all merchantmen engaged in the China trade passed through this strait, as the present route to the south of Singapore was extremely unsafe owing to the hordes of pirates which infested these seas; even in the Tebrau Straits ships were often attacked and destroyed by Malay piratical phraus. In common with the rest of Malaya, the coast-line is bold and rocky on the east, where it is washed by the China Sea, and low and swampy on the west, where it borders on the Straits of Malacca. The formation is chiefly granitic, traversed in places by veins of quartz and dykes of intrusive masses of diorite, quartz felsite, trachyte, etc. This granite is overlaid by a series of clays and clay shales, with here and there beds of laterite. These clays are non-fossiliferous, and are probably of Paleozoic origin. In the north-east a little sandstone is found, whilst in the extreme north-west there are signs of a limestone formation. On the east coast the clay shales show distinct evidences of metamorphism, in some places, notably near Kuala, Indau merging into a highly stratified clay slate. Amongst these shales and slates are masses and deposits of brown ironstone.

Before proceeding further, it may be interesting to give a short *résumé* of the history of this state. The Sultans of Malacca, before they were driven out of that place by the Portuguese, who were succeeded by the Dutch, may be said to have been the dominant power over the Malay

* Paper read at the Royal Geographical Society, February 12, 1894. Map, p. 356.

peninsula, the Archipelago, and the eastern parts of Sumatra, although each of the states and territories beyond the immediate neighbourhood of Malacca was occupied and governed by its own chiefs under different titles; independent within their own provinces, but feudatory or tributary to the sovereignty of the Sultan of Malacca. The state of Johore is a case in point. Although the first authentic records date only from the days of the Portuguese conquest, yet we get occasional historical glimpses of the Sultanate of Malacca as far back as the earlier part of the thirteenth century, when the then reigning Sultan, Mahmud Shah, adopted the faith of Islam. In 1511 Sultan Ahmed, being driven out of Malacca by the Portuguese, removed to Muar, then to Johore; subsequently his successors retreated still further southwards to the island of Rhio, and finally to Lingga. As the sultanic power gradually declined, the most northerly states of the peninsula first, and finally those to the south, one by one naturally grew really independent, became tributary to one another, or formed treaties with the European powers of the time. Thus the hereditary Temenggong, or chief of Johore, virtually became an independent ruler. We find Johore taking an important part in the one hundred and forty years' struggle for Malacca between the Portuguese and the Dutch. At that time the seat of Malay Government was established at Johore Lama, on the Johore river. Up to 1773 the Negri Sembilan or Nine States were feudatory to Johore, but afterwards they petitioned for and obtained a chief of their own from Menangkabau. When, in 1795, the Dutch in their turn were driven out of Malacca, they forcibly took possession of the Carimons and several other islands then under Johore. At the restoration of the Dutch possessions at the peace, they were still allowed to retain these islands; and when, in 1819, the grandfather of the present Sultan, and the then and last titular Sultan of Johore, ceded Singapore to the British, Johore rule became virtually confined to the mainland. By the treaty of 1855 the British acknowledged the *de facto* administrative right of the Temenggong, and the capital was again removed to Johore Bahru, or New Johore. In 1868 the title of Maharaja was assumed by the present ruler, and this was again changed to that of Sultan by the Treaty of 1885, thus restoring the old Malacca title.

Very little literature exists relative to the geography of Johore. Hervey of Malacca in 1879 made a journey towards the source of the Indau Sembrong, and published an article in the Journal of the Straits Branch of the Asiatic Society. In 1878 the same traveller made a short trip to the Blumut region. Mikluho Maclay in 1875 made an ethnological excursion through portions of Johore; but, as he was occupied chiefly in observations on the Jakuns, his articles published in the *Asiatic Journal* contribute very little to the geography of the territory. Up to 1890 very little was known of the interior beyond the Sembrong rivers. Dato Luar, chief surveyor of the Johore Government, had

mapped the Muar river, and more or less accurate surveys had been made of the Batu Pahat, the Johore, and the big Sedili river of the Blumut region; of the Upper Indau little or nothing was known. In 1891 the Straits Branch of the Asiatic Society published a fresh edition of their map of the Malay peninsula. As regards Johore, beyond Hervey's survey of the Indau Sembrong, and Dato Luar's work on the Muar Batu Pahat and Johore rivers, it contained little new data of value, and naturally many errors in the position of hills and rivers occurred. Hervey's survey of the Sembrong, considering that it was only time and compass work, was very fairly accurate, except at the source, where it required considerable revision.

Owing to the dense jungle, survey work in Malaya is a most tedious and trying affair. It is impossible to do much traversing with the theodolite, and a systematic triangulation in such a wild country is at present out of the question. I therefore contented myself by fixing a number of prominent peaks and hill-tops by a series of astronomical observations, and then filling in the small tracts of surrounding country by prismatic compass; where the country was moderately open, the plane table was used. By these means the whole of the territory was mapped within two years. This work, while it does not pretend to the accuracy of a regular triangulation, is, I think, sufficiently reliable to serve all practical purposes for some years to come. The heights were in most cases determined by aneroid barometer, and may be regarded as approximate only. Mounts Ophir, Janing, Pulai, and a few others, were, however, determined by a careful series of boiling-point observations.

To those accustomed to read and speak of the huge distances traversed by African explorers, the small area covered by travellers in Malaya will appear very unimportant and trivial. It must seem an easy affair to get across 100 miles of jungle country within the week, but I would like you to consider the drawbacks to rapid and easy locomotion in this country. The interior consists of one dense mass of jungle. Swamps, undulating ground, and mountains alike covered with rankly luxuriant tropical vegetation, so thick and so closely interlaced with thorny creepers and rattans that it becomes almost impossible to move a yard in any direction without previously cutting a path. Even on the smaller rivers the foliage and creepers will stretch entirely across from bank to bank, and a way must be cut for the canoes to pass under; whilst the river-bed is full of snags and fallen timber, which have to be hacked through or moved before a passage can be effected. Although there is no regular rainy season, scarcely a day passes without a downpour, occasionally as much as 25 inches falling in one week. This quickly converts the low-lying ground into a series of almost impassable swamps.

The unexplored country is in most cases trackless and uninhabited;

it therefore becomes impossible to obtain supplies of any kind *en route*. I have found that only the natives of the interior are of any value as carriers and guides, but the far up-country villages are so few and so sparsely inhabited that it is extremely difficult to obtain sufficient carriers for any one expedition. Of these men, however, I cannot speak too highly. Plucky and patient, they will carry their load of from 35 to 40 lbs. day after day across the most difficult and dangerous country; the few rags they possess as clothing drenched night and day; sleeping without shelter in the reeking undergrowth, and living on rather less than a pound and a half of what was often mouldy rice a day, together with a morsel of dry fish and a little tobacco. A few weeks of this work put half your men *hors de combat*, with fever and ulcerated feet and legs; yet they struggle on, and one seldom hears a word of complaint. As supplies of food cannot be depended on *en route*, nearly every available man is employed in carrying that oriental staff of life—rice. Personal outfit is cut down to the smallest possible amount; tents, camp furniture, and European stores must be dispensed with; and the traveller must practically live in the same manner as the natives.

To an ordinary traveller in the interior, the Indau river and the Tenang hills, amongst which it takes its rise, will present the most interesting features. The Indau proper, which is only about 75 miles long, rises between the mountains, Besar and Chabang-tiga, pursues a southerly course, and empties itself into the China Sea in latitude 2° 40′ 0″ and longitude 103° 36′ 10″. As is usual with nearly all the rivers of the peninsula, the amount of detritus brought down during the rains is enormous, when we consider what a short course these rivers run; the natural result of this is the formation of a bar at the "kwala," or river mouth, which effectually prevents the entrance of ocean-going steamers, except a few of comparatively light tonnage. The Indau is no exception to this rule, and during the north-east monsoon the estuary is completely closed to craft of every description.

For a distance of 30 miles the Indau is a broad tidal stream easily navigable by small steamers; at this distance the junction with the Sembrong river is made, beyond which point the stream narrows rapidly and becomes shallow and sandy. Dykes of felsite, diorite, and granite porphyry, which run in well-defined courses from west to east, have occasioned a most picturesque series of small waterfalls and rapids, which, however, render navigation extremely slow and somewhat dangerous. The banks are high and covered with splendid timber. In the neighbourhood of Mount Janing are two or three small Jakun (*i.e.* aboriginal) settlements; but the upper reaches are trackless and uninhabited, save by the tiger and elephant, the crowds of monkeys, and the brilliantly plumaged birds, among which the hornbill (*Buceros rhinoceros*), the Argus pheasant, called by the Malays "kuau," and the "pergam," or grey pigeon, predominate. During my journey to the source of this river

in 1891, I met with thirty-two of these rapids in the course of 20 miles; this short distance was only accomplished after six days of extremely hard work, or rather less than $3\frac{1}{2}$ miles a day. Many of the canoes were swamped, and others stove in, and the source was eventually reached by wading and scrambling along the bed of the stream.

The canoes, or "jalors," as the natives term them, used on all rivers of the interior, are constructed from a single tree cut longitudinally, hollowed out by fire, and finished with the "bliong," or Malay adze. Some of these canoes will carry twenty to thirty men, but for navigating the rapids they are built very light and small, carrying two or three persons only.

On reaching the source of the Indau, we found ourselves in the midst of an unknown hill-country, the central elevation of which was Gunong Chabang-tiga, or the mount with the three branches. From the summit of this hill, 3100 feet above sea-level, a number of observations for latitude and time were made. On the lower slopes of Chabang-tiga the tapir and rhinoceros are to be found. I managed to shoot one of the former, a full-grown male, and also a fine specimen of the Malayan honey-bear (*Ursus Malayanus*). Notwithstanding the name, this latter is an inoffensive animal, often trapped and tamed by the natives.

Before the survey work in the Tenang hills was complete, we ran short of stores, and I was forced to make a move for the Segamat river. Five days of hard going, during which time we lived on fruits and tapioca root, brought us out at the Jakun village of Penglima Pute, on the Pukin river. Here we got a little rice and Indian corn; but, much to my disgust, I found an aboriginal wedding-feast in progress, and my carriers insisted on remaining two days in order to take part in the festivities, which, as far as I could see, consisted in the people gorging themselves with green corn and sugar obtained from the Cabong palm, thumping tom-toms, and dozing in the intervals. Eventually a start was made, and a tramp of three days brought us to the banks of the Jekati river, where we came across another Jakun village. Here I lost one of my best guides, who was taken from the midst of his sleeping comrades by a tiger. The work in the neighbourhood of the Jekati and Bukit Asoh occupied my party several weeks, during which time I had many opportunities of making observations on the natives of the interior.

From an ethnological point of view, probably the most interesting feature of Johore exists in the survival of these aboriginal inhabitants of the peninsula, whose forefathers roamed the jungle long before the advent of the Malays, who probably were drawn to the peninsula from the islands of the Archipelago. In Johore these aborigines are known as Jakuns, while in Pahang and Selangor they are termed Sakai. The Malays apply various other names to them, such as "Orang benua" (men of the soil), "Orang utan" (forest men), and so on. They are

usually found very thinly scattered in the most inaccessible portions of the jungle.

These semi-wild people are undoubtedly of Negrito origin, but interbreeding with the Malays has in most cases considerably altered and modified the original primitive type, although as a general rule they preserve many of the leading characteristics of the Negrito. Miklucho Maclay, who made an ethnological excursion through portions of the peninsula in 1876, is inclined to think that these aborigines were originally a pure branch of the Melanesian race, but that the Johore Jakuns have now become a mixed Melan-Malay tribe. There seems to be a distinct family relationship between these people and the natives of the Andaman and Philippine Islands. Some authorities are of the opinion that they are of Papuan origin. Wallace, however, while admitting that the Negritos are a distinct race from the Malay, considers those inhabiting the peninsula to be in all probability of Asiatic rather than of Polynesian origin.

The increasing intercourse with the Malays is most strikingly exemplified in the rapid decay of the aboriginal tongue. A few generations ago these aborigines possessed a distinct language, primitive, it is true, but utterly unlike Malay; of late years this has degenerated into a mere dialect, largely composed of Malay words. For the preservation of a number of true Jakun words we are indebted to a superstitious usage largely practised by the jungle Malays and Jakuns, and known as the "Pantang Kapor;" translated liberally, this means the "Observance of the camphor ceremony," of which the following is an explanation.

The camphor tree (*Dryobalanops camphora*) grows abundantly in certain parts of the peninsula, but only occasionally contains camphor crystals. Now, the camphor in question is not at all similar to that obtained from the camphor laurel; it is known in commerce as Borneo camphor, or Borneol, and is in great demand by the Chinese, who use it in embalming their dead, as an incense, and in medicine; being rare, it always commands a high price. As it by no means follows that each camphor tree contains this valuable product—in fact, it being rather the exception than the rule—recourse must be had to the species of witchcraft known as "Pantang Kapor." Therefore, to ensure good luck, the hunters while on their expedition must speak the camphor language, and observe certain practices, in order to propitiate the spirit of the camphor tree, which is known by the Jakun name of Bisan (lit. a woman). Her resting-place is near the trees, and at night when a peculiar noise, much resembling that of a variety of cicada, is heard in the forests, the Bisan is abroad, and camphor will surely be found in the neighbourhood. The language of the camphor spirit consists of a mixture of Jakun and Malay words, with a large proportion of words of Malay origin, but curiously altered or reversed.

The following are a few examples of the Pantang Kapur language:—

A. Words of Malay derivation—

1. Sword = *manchong*, from *Panchang*, to cut or to sever.
2. Tail = *p'nurun*, that which causes to descend; that which hangs down or droops.
3. Chest = *hadap*, the front part.
4. Wrong = *salek*, from *Salah*.
5. A long time = *Awal*, the first, therefore the time that first passed away.
6. Pineapple = *s'jambol*, the thing with a long tuft of hair or a tassel.
7. Dammar (resin) = *sohoh* = *suloh*, a torch.
8. Sail = *sayap*, a wing.
9. Sand = *p'nabu*, the thing that resembles ashes, from *Abu*, ashes, or *abok*, dust.
10. Shore = *kring*, dry, meaning the dry land.
11. Spark = *bunga p'hangat*, the flower of the heater, or fire.

B. Words of aboriginal origin—

1. Rich = *kon*.
2. Poor = *pyeng*.
3. To sink = *m'pior*.
4. Wide or stout = *bagin*.
5. Open = *rayat*.
6. The sky = *tongkat*.

The Jakuns live in small communities on the banks of jungle streams; those of the Jekati, Palong, and Segamat rivers are the most primitive. They subsist miserably on fruits, tapioca, roots, and small fish and reptiles. They seldom remain many weeks in the same spot, but wander from place to place, living under scanty leaf shelters built on rickety poles at a considerable height from the ground. It is not at all uncommon to find a dozen men, women, and children in company with a tame monkey or two, a few dogs and cats, innumerable fowls, and perhaps a tame hornbill, living in perfect harmony under the same miserable shelter. These aborigines are all very expert fishermen, using chiefly the three-pronged spear or trident; no less skilful are they with the sumpitan or blowpipe, which, with its darts tipped with the deadly Upas or Ipoh poison, constitute their chief weapon. On the Serting river these sumpitans are manufactured from a very long-jointed, straight variety of bamboo, which is generally carved and traced with many rude devices. The darts consist of thin splinters of wood about a foot long, having a plug of pith at the butt end. The point is as sharp as a needle, and is covered with a black resinous substance; in many cases this is extremely poisonous—so much so, in fact, that monkeys and other small animals die from its effects almost immediately; on man and the larger animals its effect is far less rapid, but quite as deadly. This poison is known to the Malays as Ipoh, and is popularly supposed to be obtained from the Upas tree; but I am inclined to think that in most cases death results from the action of an alkaloid which is either strychnine or else

closely allied to it, which is obtained from quite a different species of tree. The juice of the Upas is very rarely obtainable in Johore. Probably each tribe or even each family of aborigines possesses a different and secret method of preparing the dart poison, which varies within very wide limits in its toxicological effects.

The Jakuns of the Indau and Sembrong rivers are, owing to their intercourse with Malay and Chinese traders, much more civilized than their brothers of the Palong and Jekati; they plant a little rice and Indian corn, wear a certain amount of clothing, and live three or four families together, in thatched bamboo huts. The true Jakun is of short stature; 5 feet 2 inches is a fair average height. They are much darker in colour than the Malays, and as a rule not at all well set up. The hair, which in the pure Negrito curls closely, is here in most cases simply wavy, or even straight. They appear to possess no particular form of worship, but are great believers in the existence of evil spirits. When a man dies he becomes transformed into a spirit that roams the jungle; thus on the grave of a newly buried body they place various kinds of food, a torch, cooking utensils, the sleeping-mat, and weapons of the deceased, for his use and protection in the shadowy land.

Late in September, the Jakati having risen sufficiently to make canoeing practicable, I broke up camp at Bukit Aso, and proceeded down stream to the confluence of the Keratong river. In travelling in canoes one sees far more of the bird and insect life of the country than when actually tramping through the jungle. Birds of every size and colour, from the tiny bronze green sun-bird, and the blue and orange kingfisher, to the big crimson-beaked black hornbill, rise from the trees. Insect-life swarms in myriads; dragon-flies of bronze blue, purple, and vermillion, and butterflies in every shade of yellow, from pale primrose to orange, delicate rose-pink and bright crimson, are in endless variety. Now and then a lizard or snake will glide away in the dense undergrowth, while troops of monkeys chatter and scurry off, crashing through the trees, and taking breakneck leaps from branch to branch in their haste to escape the intruders. On each side is primeval forest, huge trees loaded with creepers drooping in a thousand fantastic shapes, dark green foliage, yellow sand and clear water, overhead a blue sky and blazing sunshine. But let a cloud obscure the sun, and the whole aspect changes; the trees and water look sombre, the birds and butterflies vanish, and one comes down from the clouds and begins to speculate on the chance of getting the camp built without a wetting, and whether Ibrahim the cook will burn the rice as he did yesterday.

We duly reached the little settlement of Keratong after three days' canoeing. Here we found the natives had trapped a fine tiger alive in a pit, and I thus had an opportunity of examining the big cat at close quarters. The Malayan tiger does not seem to attain such a large size as its Indian congener, but is apparently quite as powerfully built and

extremely well marked. One of the headmen showed me a leopard's skin; this animal, the "H'rimau bintang," or starry tiger, as he termed it, is, I believe, exceedingly rare in the peninsula.

From Keratong we made our way overland through dense bamboo jungle to the Palong river at Jeram Badok (the rhinoceros rapids). For miles around this place the country had been overrun by herds of elephants, who had levelled acres of jungle, and broken into and destroyed many of the corn and padi fields of the villagers. However, with the exception of hearing their trumpeting at night, we never came across any further signs of them. At Jeram Badok my Jakun guides brought in many specimens of monkeys, generally shot with the poisoned darts of the sumpitan. Amongst these were two white-handed gibbons or wau-wau's (Malay "Ungka")—this monkey is extremely shy, frequenting the densest forest and keeping in the tops of the highest trees; also a pig-tailed monkey, the "Broh" of the Malays, and several of the black "lotang" variety (*Semnopithecus obscurus*).

The Palong river rises in a big swamp on the northern frontier. The stream is sluggish, and, strange to say, much deeper and broader near the source than at the mouth. Here, as on the Indau, we found numerous diorite dykes. Eventually we reached the source only to find that Tasek Bera, which had been laid down in the existing maps as a big lake, was in reality a huge dismal swamp traversed by a few muddy streams. Our experiences whilst trying to penetrate into this region were anything but pleasant, and when, after three days' hard work, we reached what the Jakuns assured us was the boundary between Johore and Pahang, nobody was more heartily glad to commence the homeward journey than myself. The return was not commenced a day too soon, for the rains set in heavily, and the swamp became hourly more difficult to traverse. However, by pitching away nearly all our stores and kit, we reached the canoes again, made a rapid journey down the Palong to its confluence with the big Muar river, and eventually arrived at Bandar Maharani, where we obtained a steamer to Singapore.

The two Sembrong rivers are, I think, worthy of a short description, from the fact that they both rise in a swamp in the centre of Johore; from thence, one, the Indau Sembrong, flows east to the China Sea, while the other, the Batu Pahut Sembrong, pursues an exactly opposite course, and empties itself into the Straits of Malacca. Hervey, of Malacca, who in 1876 explored a portion of the Indau branch, came to the conclusion that at the source a running stream actually rose and flowed in opposite directions. This, however, is not quite the case, as the two rivers have their common origin in a swamp. Nevertheless, theoretically speaking, the southern portion of Johore is an island. In the course of my work on the Sembrongs in 1892, I was able to cross in small canoes from the east to the west coasts, with the exception of five miles of swamp, which

had to be waded through. A little deepening of the streams of the source, and a cutting through the swamp, would enable canoes to pursue an uninterrupted journey completely across the Peninsula, at a time when the North-East Monsoon closes all ports on the China seaboard. Both these rivers have very little fall to the sea, and in places spread out into big swamps and lagoons, overgrown with rasau, a species of Pandanus. The Kahang and the Selai are the two chief tributaries of the Indau-Sembrong, the former rising in the Blumut Hills, and the latter in the Tenang Range; the banks of both are very thinly inhabited by Jakuns. The forests at the source of the Kahang are noted for the camphor and "gahru," or eagle-wood (*Lignum aloes*), which they contain. On the Batu-Pahat Sembrong, and its more important tributaries, the Chinese agriculturists have settled in large numbers, planting chiefly pepper and gambier; as this latter product is not commonly known in England, it may be well to describe it.

Gambier is a product obtained from the leaves of a climbing shrub (*Uncaria gambir*). It is largely produced in Johore and the Archipelago by the Chinese. The leaves and twigs of the shrub are boiled in huge cauldrons and well stirred for some hours. The liquor is then strained, concentrated, allowed to cool, and made to set by frequent stirring, when it presents the appearance of a bright yellow clay-like mass, which is cut into cubes, allowed to dry, and in this state exported. The chief use of gambier is as a tanning material, in which it is only second to oak bark. It is also employed as a brown dye, and for strengthening canvas. Its composition is similar to cutch, consisting mainly of catechin.

Each group of plantations possesses what is known as a "kangka," or village. Here resides the "kangchu," or Chinese headman, also the representatives of the various syndicates, or "kongsees" of Chinese speculators. The gambling-house, with the opium store, is also here. Around the central buildings, which are often of a substantial character, are grouped the shops and stores, the eating-houses and innumerable pig-pens,—everything built on the ground, of bamboo and round poles thatched with palm leaf. Scores of such "kangkas" exist on the banks of the Johore, Batu Pahat, Muar, and Sedili rivers. The Chinese are principally Tinchus or Taichus, who come down from the province of Swatow; other clans or provinces are represented in the following order: Hokkiens, Kehs, and Macaos. These coolies are mostly brought from China to Singapore by Chinese labour agents, who defray their preliminary expenses, such as passage, food, clothing, etc. At Singapore they are placed in depôts, until engaged by planters from various parts of the peninsula, when their names are registered in the office of the Chinese Protectorate, the registration fee and the commission of the agent being paid by the engaging planter or trader. New coolies are known as "Singkehs," signifying "new men;" while "Laukehs," or "old men," distinguish those that have been at least three years in Malaya.

Needless to say, these latter command higher wages than the "Singkehs." These Chinese immigrants, naturally indifferent to their ruler, provided their personal independence is secure, generally make very contented and peaceful subjects, and notwithstanding the fact that they are in a very large majority—in the Territory numbering some 200,000, as compared with less than 100,000 Malays—disturbances are of very infrequent occurrence, and of an unimportant character; possibly the efficient police force maintained by the Government has something to do with this.

Johore, unlike the northern portions of the peninsula, is not a mountainous country; the main central ranges of Malaya here break up into small isolated groups of hills, rising as islands from a sea of flat jungle. The most important of these will be the Blumut group, situated almost in the centre of the Territory. In 1890 I made the second ascent of Mount Blumut. The journey is, however, an extremely toilsome one. The low-lying ground at the base is simply a big swamp, and at times we were forced to erect rough platforms in the trees to enable us to pass the night, there being no ground solid enough even to build a fire on. The myriads of leeches in these swamps did not tend to increase our comfort, and in a few days we were covered with ulcerating little sores, from their incessant biting. The following extracts from my journal describe the actual ascent.

On December 26, after eight hours' very hard work, descending one hill, only to find we had to clamber over others, the Jakun guides slowly hacking a path through the dense undergrowth, we arrived just at sunset at the foot of Blumut, and camped on the banks of a small spring of excellent water, probably one of the sources of the Kahang river. Towering above us is Blumut, tier after tier of rock terraces all thickly covered with vegetation, and terminating in one little peak, in shape a truncated cone. It is probable that there is no water much higher than this point. And therein lies the difficulty, for many of my men are helpless with fever; so the stores necessary for a protracted stay on the summit cannot be carried—everything depends on our being able to make the ascent, take the necessary instrumental observations, and descend again to this spot within forty-eight hours, as it will be impossible to take sufficient food and water to last more than half that time.

My next entry is dated December 30. On the morning of the 27th, leaving five sick men in camp and taking a little cooked rice and water with us, together with the necessary survey instruments, we commenced the ascent. Soon our troubles began, as in many places the mountain-side was practically perpendicular, and we were forced to cling to roots and shrubs. Before noon it became a question of abandoning the water and most of the rice, or the instruments. Throwing aside the former, we were enabled at 3 p.m. to reach the summit of Gunong or Mount Bechuak; at least, I presume it was that hill. After getting the small timber cut away, I saw that Blumut still

towered above us, being separated from Bechuak by a steep and narrow ravine.

That night it blew a gale, and the hill-top was enshrouded in driving clouds; entirely without shelter save a few branches, we spent a miserable night, crouched round a small fire, which seemed nothing but smoke. Next morning, after a handful of cold rice apiece, we descended the ravine, clinging to roots and stones. At the bottom we were horribly disappointed to find there was no water. The final ascent of Blumut was commenced at 8 a.m., the vegetation becoming sparser and going more difficult every minute. At last, at noon, the summit was reached. From the top of a pile of granite boulders I got a magnificent view of practically the whole of Johore Territory lying like a huge panorama, one mass of thick dark green jungle, with here and there a patch of bright emerald, marking a clearing of cultivated land; overhead the sun glared down from a cloudless sky, and not a sound broke the stillness of the solitude. To the north-west, Mount Ophir towered upwards with a few fleecy clouds clinging around its summit. Away northwards, beyond the Segamat country, rose the Tenang hills. East of these a stretch of flat land, and then the China Sea, dotted with islands and shining like burnished silver. Following the rugged coast-line southwards, comes the Selat Tebrau or old strait dividing the peninsula from Singapore Island. South-west lay Gunong Pulai, rising from a sea of jungle and having for its background the Straits of Malacca; then miles of mangrove swamp to the Batu-Pahat river, and so along the west coast to Muar and Mount Ophir again.

Four hours were spent on the bare summit, taking observations; and then our thirst, becoming simply insupportable, compelled us to descend the ravine, where we made another fruitless search for water. Evening found us again on the summit of Bechuak, where we spent another wretched night; luckily towards morning a heavy dew fell, enabling us to squeeze a little moisture from the moss which grew abundantly there; it was, however, intensely bitter. On the morning of the 29th the observations were completed, and we managed to make our way back to camp late on the same day. When in sight of water, my men made a rush and literally threw themselves into the shallow stream, where they lay at full length, lapping the water like dogs. On the lower eastern slopes of the Blumut hills rises the Sedili Besar or Big Sedili river. This river is chiefly remarkable for the number of its small tributaries, which form a perfect network, especially toward the north, where numbers of Chinese planters have settled. The Lenggiu rising on the south slopes is a comparatively unimportant stream, which uniting with the Sayong forms the Johore river.

Blumut is a corruption of the Malay word Berlumut, meaning mossy; the stunted vegetation on the higher slopes of these hills being so completely covered with moss that it sometimes seems as though one

were walking through a series of little mossy tunnels. The height, determined by aneroid barometers only, is 3100 feet; at night the temperature sinks to about 65° Fahr.

The Jakuns assert that formerly the aboriginal tribes of Johore and the neighbouring states looked on Blumut as the centre of the universe, being in fact the pivot to which the rest of the earth was attached and held together; consequently these hills are firmly believed to be haunted by all sorts of fearful and wonderful spirits, "hantus," "poyangs," "djins," "kramat tigers," and so. The two hills Bechuak and Chimundong lie on either side of Blumut. Respecting the position of these three hills the Jakuns have a legend that Blumut, the husband, possessed two wives, Chimundong, old and ill-favoured, Bechuak, young and pretty. In a fit of jealousy Chimundong cut off Bechuak's hair, who retaliated with a severe kick (the mark of which is still to be seen half-way down the slopes); at this point Blumut interposed his huge bulk between the two, and has been forced to remain there ever since in order to preserve peace.

The province of Muar occupies the north-western portion of Johore territory. It comprises chiefly the tract of land bordering on the Muar river and extending to the frontiers of Malacca and the Negri Sembilan. The chief town, Bandar Maharani, is at the kwala or mouth of the Muar. Ten years ago this was a mere collection of fishers' huts, but under a judicious administration it has grown into a flourishing little place, possessing a daily steamer service to and from Singapore, and a considerable export trade. The Sultan is represented by a Resident. From the town a light railway runs for a short distance to the village of Padang, the centre of a very fertile agricultural district. The banks of the Muar are thickly settled by Chinese gambier and pepper cultivators, as far as Bukit Kepong, a big village 70 miles up stream. Beyond this point the country is sparsely inhabited by Malays, who plant a little padi, but are chiefly employed in collecting jungle produce, such as damar, a resin obtained from various trees, "minyate kayu," or wood oil, gutta-percha, the true gutta, yielded by one tree only, known to the natives as Geteh Taban Merah. Unfortunately, in order to obtain this easily, they fell the tree. Indiarubber or caoutchouc, the dried juice of various climbing plants, is very plentiful. A large trade is carried on in rattans, of which over 30 varieties are exported.

The Muar river is the longest in the territory; it rises in Berembun in the Negri Sembilan and pursues a south-westerly course to the Straits of Malacca. The upper portion from the village of Jembu Lepan to the mouth of the Geme river, forms the boundary between Batin Gemelas district and the protected state of Johol, which is a portion of the Negri Sembilan. The Batin is the hereditary chief, but the supreme jurisdiction over his district is claimed both by the Sultan of Johore and by the British on behalf of Johol. The Batin's country consists of 500

square miles of trackless jungle and swamp, inhabited by wandering families of Jakuns, save along the bank of the Muar where a number of Malays have settled. The chief village is Jembu Lepan, which is near the confluence of the Jempole and Muar rivers. Here the Jempole is separated from the Serting river by a strip of flat swampy land, only 450 yards wide. It is therefore comparatively easy to haul canoes from one river to the other, and as the Serting is a tributary of the Bera, which joins the big Pahang river, travellers are enabled to make a canoe journey from Kwala Muar to Pahang, and thence out to the China Sea.

By far the most fertile portion of the Muar province is the Segamat district, which includes the plain of Tenang, lying at the foot of the Tenang range, and watered by the rivers Segamat, Juase, Pukin, and Tenang. The Chinese have not yet been admitted to this district, which is admirably suited for the cultivation of rice. As the Straits Settlements and Johore are entirely dependent on Siam and French Cochin China for their rice-supply, the cultivation of this cereal on a large scale in Johore is of the highest importance, and I believe there is already a project on foot to open up Segamat for that purpose.

The chief elevation in the territory is that of Mount Ophir, or Gunong Ledang, as it is called by the Malays, in Muar Province. A reference to the map will show its position. It is in the centre of a small group of hills, which at one period probably formed part of one of the main central ranges of the peninsula. From the sea it forms a very prominent landmark, owing to its abrupt rise and sharply defined peak. The height, carefully calculated by a series of observations with the boiling-point thermometer, is 4150 feet. It was long thought to be the highest mountain in the peninsula, but Gunong Tahan, in Northern Pahang, is probably twice that height. It was in endeavouring to reach this last-named mountain that Mr. H. M. Becher, who was exploring under the auspices of this Society, lost his life. The name Mount Ophir was probably given in the seventeenth century by European traders and adventurers, always on the look-out for the gold-bearing Ophir of Biblical fame. Considerable quantities of gold have been obtained in this neighbourhood, but the alluvial deposits are now practically worked out; of late years a little reef-mining has been attempted, with partial success only. The geology of this district appears to be very simple. The mass of hills of which Ophir forms the centre is of granite, containing the biotite variety of mica. In places this granite passes into gneiss; the lower hills and spurs particularly contain much gneiss, here and there traversed by dykes of quartz felsite. The surrounding country is either flat or undulating, consisting entirely of clay shales of various colours and degrees of hardness.

The ascent is a difficult one; but there is now a fairly well-defined path, and within 50 feet of the top is a spring of excellent water. The summit is a rocky platform, sparsely covered with rhododendrons and a

few other shrubs. There has been some talk of opening a bridle-path, and establishing a small sanatorium near the summit, for the use of residents in Singapore, Johore, and Malacca. It is certainly a good idea, as the nights are cool; there is an abundant supply of water, no mosquitos, and a magnificent view. According to local tradition, there is a beautiful enchanted putri, or princess, living on Ophir, attended by a large cat, to see whom is a sure sign of good luck. On attempting, however, to speak to her, the cat changes into a tiger, with disastrous results to the rash interviewer.

The capital of the territory, "Johore Bahru," was founded by the present ruler some 35 years ago; it is now a flourishing little town of about 15,000 inhabitants, the seat of government, and the residence of the Sultan. It is situated on the Selat, or Straits of Tebrau, and lies about 15 miles north-west of the town of Singapore, separated from the island of that name by the above-mentioned straits, which are only about one mile wide at this point. Viewed from the Singapore side of the straits, the town presents a very picturesque appearance, built as it is along the shore, with the surrounding small hills dotted over with bungalows and well-laid-out gardens, the artistic palm-thatched native houses mingling with the more substantial stone buildings of the Government. Facing the sea is the Istana Laut, the principal residence of the Sultan, a long two-storied building fitted up with every European comfort and luxury, and looking deliciously fresh and cool in the glaring sunlight. Well-laid-out roads, an esplanade over a mile long, large airy hospitals, waterworks, and wharfs all testify to the enlightened and energetic administration of the present ruler.

Like all other Malayan and Oriental states, the usual autocratic form of government theoretically prevails in Johore. Practically, however, this state, a small but proud remnant of the old and powerful Johore-Malacca kingdom, has, since the accession of the present ruler, enjoyed a form of administration which may almost be described as constitutional. The Sultan is assisted by a council of state, the members of which are composed of chiefs and nobles who are mostly heads of Government departments. The working of the different departments is similar to that of a British Crown colony, it having been the anxious desire of Sultan Abu Bakar to make the form of his government as nearly similar to that of the government of the neighbouring Straits Settlements. The Sultan metes out justice with an impartial hand, being in all cases strongly and intelligently assisted by his judicial officers. All the usual courts of justice may be said to exist in Johore; but over and above these dominate the Council of State as a supreme court of appeal, to which no subject of the Sultan is denied access.

The success of the government of the Sultan is demonstrated by the great and increasing influx of Chinese into the territory; these immigrants, who are chiefly gambier and pepper planters, numbering not

less than 210,000. They are an industrious and law-abiding people, and may be said to be the commercial backbone of the state. Besides the Chinese, Johore receives from time to time immigrants from neighbouring Malay states, Java, and Siam.

The revenue of the state is principally derived from the import duties on opium and spirit, and the export duties on gambier, pepper, and forest produce. I may mention that Government has many other legitimate sources of revenue, which, for reasons best known to the ruler and his advisers, are still untouched, there being, for instance, no other taxes or duties on the population besides those named above.

The population of Johore may be taken roughly at the following figures:—

Malays	50,000
Javanese Bugis, Siamese and other natives of the Malay Archipelago	30,000
Chinese	210,000
Natives of India, Arabs, Eurasians, and Europeans ...	10,000
Total ...	300,000

Although the mineral resources of the territory are of comparatively small importance, so much tin is annually exported from other parts of the peninsula, that I venture to enter into a brief description of the mining as carried on in Johore. The tin deposits in this state are entirely alluvial, the chief district being the tract of flat land lying on either side of the Johore river, and extending to the slopes of the mountains Panti and Mentahak. In common with the northern portion of the peninsula the hills and mountains of Johore show absolutely no signs of the existence of tin oxide *in situ*—that is, in distinct veins running through the country rock. Various theories have been put forward to account for this remarkable fact, as it is certainly an anomaly that a country so extremely rich in alluvial tin as the Malay Peninsula should show no trace of the pre-existence of that metal in the form of true veins. Personally I am inclined to agree with the late H. M. Becher that the tin oxide occurs within certain zones of the granite country rock so minutely disseminated as to be almost regarded as an integral constituent of the rock itself. In cases where the deposit is very rich and coarse grained, it probably pre-existed in the form of a series of minute and irregular veins, or a "stockworke" as it is termed, in the granite.

On the alluvial plain of the Johore river the following is a typical section through the tin-bearing ground:—An overburden of from 10 to 12 feet of soft yellow clay mixed with sand. Below this the stanniferous stratum from 1 foot 6 inches to 2 feet thick, consisting of gravel, very small waterworn grains of cassiterite and quartz fragments, mixed with yellow clay. Underneath this comes a stiff greyish-white clay containing no tin, and of unknown depth. The yield of tin ore varies, within very wide limits, from a few ounces to 50 or 60 lbs. per cubic

yard. The mining is conducted in a somewhat primitive manner by Chinese, who, however, contrive to obtain a profit in places which worked by European methods could not possibly pay.

For the past 20 years the commercial prosperity of Johore has been steadily increasing. The trade is almost entirely with Singapore, which serves as a port and distributing point for the whole of the Malay peninsula. The exports of Johore are principally gambier and pepper; in 1890, 21,577 tons of the former and 9236 tons of the latter were forwarded to Singapore for shipment. The other exports are copra, coffee, tea, areca nuts, tapioca, sago, wood oil, rattans, resins, timber, gutta-percha, indiarubber, tin. The chief import is rice, about 50,000 tons being brought in annually. The minor imports are salt fish, sugar, tobacco, paraffin oil, hardware, and Manchester goods.

Before the reading of the paper, the President said: We have here to-night a surveyor and explorer who will tell us something of his experiences while executing work connected with the delimitation of the northern frontier of Johore. But before calling upon him I cannot refrain from alluding to the untimely death of another explorer, Mr. Becher, in the Malay Peninsula, from whom we had hoped to receive news of an interesting expedition conducted by him to a successful termination. Our Council had given him its countenance and assistance because he was known to be a good observer, and had already done excellent work. He was attempting to reach a mountain in the interior of the Malay Peninsula called Gunong Tahan, three separate attempts having been made to reach it previously without success. He had ascended a river and reached its upper waters, where there were waterfalls and rapids, causing considerable danger. It is pleasant to hear that he took great pains each day to find his latitude and longitude, and it may be said that owing to his zeal in taking observations his life was lost, for when, on September 15, he had to form his camp, he would not do so on the shores of the river owing to the quantities of trees that would have obscured his view. He encamped on a stony islet in the middle of the river, because there he would have a clearer view for his observations of stars as they passed the meridian. He sat up during the night, sextant in hand, when a sudden and rapid freshet carried off the camp. He managed to get into a canoe, but it capsized and he was swept away, and his body has not been recovered. His assistant, Mr. Quin, had a very narrow escape. It may almost be said that Mr. Becher, like old Baffin on the Island of Kishm, died with his sextant in his hand, a martyr to science. Our Council (and I am sure this meeting will join with it) has resolved to send to his father our expressions of regret and sympathy at the loss of so valuable a life. Mr. Lake has also had to pass through many difficulties and dangers in the course of his survey. Fortunately we have him here with us, and I now have to request him to read his paper.

After the reading of the paper, the following discussion took place:—

The Dato Abdul Rahman, Secretary to H.H. the Sultan of Johore: Before I came in, the President told me that he would only allow me ten minutes. I do not know how much I can say in ten minutes; I can say a great deal, and at the same time very little. I have much pleasure in congratulating my friend Mr. Lake in your presence on the very interesting lecture he has given about my country. He said it is the privilege of a very few to have any knowledge of Johore at all. The majority of you will confess—you will pardon me for saying so—that you knew very little about the country before this evening. Johore, as you

see, lies between the first and second degree of latitude, just above the equator. I observed Mr. Lake did not say anything about the temperature of the country. I think it would not be out of place for me to say that the average temperature is 80°; that sounds very high. You know most of you would say India has a very high temperature, and so has Johore and Singapore. Although India proper is many degrees higher in latitude than Johore, we say that Johore—and it is the experience of many Europeans—is much cooler than India proper. Johore and Singapore have been called the Paradise of India. I don't think I ought to spoil that definition by telling you any more about the climate.

Another thing Mr. Lake has mentioned—the north-east monsoon. Now, to many of you that is almost Greek. Allow me to explain that the north-east monsoon is a wind that blows incessantly between the months of November and April, and during that time the whole of the Malay Peninsula is in a state of cold; that is to say, it is winter. The other monsoon is the south-west, prevailing between the months of May and October. The north-east monsoon, being the cold season, is supposed to be healthy, and the winds are pretty regular, either north-east, north-north-east, or north-west. The south-west monsoon is not so regular; it may be west, south-west, south-east, and it may change from day to day. Mr. Lake spoke about the aborigines: we are Malays, and here stands before you a fairly fine specimen. The aborigines were the possessors of the soil before we came to the peninsula. It sounds funny that Johore and the other states should not have been inhabited always by the present possessors, but it is so. The aborigines were the proprietors of the soil, and we, the Malays, came there from a place in the Island of Sumatra. There are very few of these aborigines, as you heard, and I may add that the inhabitants of a Jakun or Sakai village number between seven and twenty-five inhabitants. They are simply nomads, and move from place to place, living on tapioca, yam, rice, and forest produce. We have tried to bring them all into closer connection, but have so far failed except with a certain family called Seletar. They are not actually aborigines; I think they are a cross-breed between Malays and the Jacoons. They live, not in the interior, but in boats on the rivers and along the sea-coast. They have no idea of a Supreme Being. Once a number of them were walking along in a street of Johore on a Friday when we were having our service. After it was over we sent for them, and asked them if they knew anything about a Supreme Being. They said the Sultan; they did not know any other.

Mr. Lake spoke about the Pantang Kapor language. He translated it as the observance of the camphor ceremony, but it really means the "prohibition of camphor"; it is the using of certain ceremonies and the employment of certain words and expressions while in search of the camphor-tree. The Besan, or the woman, is supposed to be the "Camphor Spirit." This spirit is supposed to know the ordinary language of the people, either pure Jakun or pure Malay, and in order to approach her it is necessary to use a language unknown to her; thus the camphor language.

With regard to gambier, we are proud of our gambier. Seven or eight years ago we produced most of the gambier used all over the world, but since then other states have begun to grow it, and I suppose in time we shall only contribute a small quantity in comparison. If in the olden days, when you had to depend entirely on oak bark for tanning purposes—for turning your hide into leather, the operation took one week, with gambier the same process can be done in one day. Mr. Lake spoke very little about his map. I think his map, of which we have a reduced copy, may be considered to be the map of the day. You see there are several blanks; for example, the hill country on the east coast is still unexplored. I hope Mr. Lake will be for several years longer available to the Johore Government, and I am quite sure they will entrust him again with the work of finishing the survey he has commenced.

On the map is mentioned the name of a colleague of mine, the Dato Luar, a Malay surveyor, a naturally clever man. If he had had a proper technical education in England he would have made a not discreditable member of this Society. Some years ago he compiled a map which was lithographed and presented to the Government of South Australia after the exhibition at Adelaide. I don't suppose the Society possesses a copy of this map, which was then the map of the time; now Mr. Lake's map has taken its place. Dato Luar has worked hard all his life, and almost taught himself surveying. He has as his friends two Malay engineers, who are respectively the chief engineer of public works and the superintendent of public works, brought up by the engineer of the Straits Settlements, Major McNair. Dato Luar learned surveying from his two friends. He was given charge of the gambier and pepper plantations, and found so much disputing going on between the Chinese planters as to the boundaries of their plantations that he found it necessary to learn something about surveying, and undertook the task of surveying the plantations—I think with great success. You all know the ordinary Gunter's chain. Well, he found so many rivers that often the chain did not do the work required, and he invented a chain simply made of pieces of rattan tied together, which was so taut that he had simply to stand at one end and send a canoe across with the other, and thus obtained the measurement. Before he compiled a map I don't think the Malays had attained to that degree of knowledge; in fact, I have never been aware that a map existed among them, not even like the Chinese, whose first map of the Celestial Empire described the rest of the world as the countries of the barbarians. In 1885 I had the honour of accompanying the Sultan of Johore to have an audience of the Pope at Rome, and much to our astonishment His Holiness knew about Johore, and sent some one to take us to the gallery, where there was actually a map of the Malay Peninsula, but Johore was not marked on it. We looked all over it, and all that was marked was Puntian Besar, because years ago there was a Roman Catholic church there, and I think it exists to this day. I have to thank you very much for the indulgence you have afforded me to-night.

General the Hon. W. Feilding: The question has been so exhaustively treated by my friends Mr. Lake and the Dato Abdul Rahman, that I can have little to say. Mr. Lake has treated Johore purely from an explorer's point of view. My knowledge extends so far back as twenty years ago, when I was first a guest of the Sultan at Johore Bahru, and ever since then it has been my privilege to keep up a close friendship with him, and to watch with the greatest interest the progress his sultanate has made under his very intelligent government. There is one point of which I can hardly leave you in ignorance, namely, that three years ago, after conference with our own Government, when there was a question of connecting Singapore by railway with the other English settlements in the Malay Peninsula, and those with India, and so joining our great defensive coaling-station with India, His Highness the Sultan of Johore agreed that he should commence the survey of the line proposed through his country, with a view to laying out the railroad, and it was in that way that Mr. Lake, through me, became acquainted with the Sultan and his dominions. He did not go out as a railway engineer, but as a mining engineer and an explorer of the whole country to find out its mineral resources. I cannot leave the subject of his very modest account of his exploration without saying a few words about the nature of his work. You who have attended in this theatre for years have heard a great deal of the arduous nature and toil of exploring work; but, being a bit of an explorer myself, I can fairly say that I do not know any work at all to compare with the heavy labour and great anxiety entailed by exploration in the Malay jungle. You have seen from the photographs to-night what its character is; but that will not tell you the miles of fever-bearing swamp through

which the explorer has to pass, and in which he has to sleep at night. I think it is one of those things of which Englishmen have a right to be proud, when we think how many men we have, of a delicate physique like my friend Mr. Lake, whose pluck and sense of duty have induced him to endure these hardships which have caused him to pass more than two years of his life constantly down with fever, and who is, nevertheless, ready and anxious to go out again to complete his exploration. It is brave fellows of this description which make this Society what it is, the leading Society of that description throughout the world. So long as we have people of that stamp this Society will live. I cannot resume my seat without saying that I feel proud to be connected in any way, however humble, with two such men as have spoken to-night, one the explorer, the other the confidential adviser to the Sultan.

Lieut. Kelsall: I had the pleasure of accompanying Mr. Lake on his last trip across the Johore territory, up the Indau, and down the Sembrong, spending most of my time collecting, chiefly birds and insects, but also botanical specimens for Mr. H. R. Ridley, Director of the Botanical Gardens, Singapore. From what Mr. Lake has told you, you can conceive how difficult it is to move about Malayan jungles; in the state of Johore it is one continuous forest from one sea-coast to the other. In many parts you cannot move a yard without cutting your way through brushwood, and very often it is rattan jungle—long trailers armed with thorns that catch in the clothes and flesh, and hinder in every way. When we come to collecting, these difficulties are more felt. In the first place, the foliage is so very dense it is difficult to see birds and beasts, and when you do see anything it is difficult to get a shot at it, and difficult to find things when they are shot. The fauna of Johore is pretty rich. The greater number of the mammals and birds found in the peninsula are found here, as it offers both lowland and mountainous country. The larger mammals are rarely seen or heard; they are extremely timid, and, although one may frequently come across their tracks, it is very seldom that the animals themselves are actually seen. The elephant, the rhinoceros, the tapir, the bison, and the tiger are the larger ones; and there are several deer—the sambur and the little kijang, and one or two smaller kinds. Birds are pretty plentiful, but it is most tedious work collecting, as they are not only difficult to see, but they do not congregate in great numbers. It is possible to go a whole day and only see a small number. Some of the most noteworthy are the argus pheasant, in the mountainous districts. They are heard every night and morning as soon as one arrives in the hills. The Malays call it *burong kuau*, because of its note, a sort of musical wail, but it is a bird hardly ever seen in its wild state. Specimens are got by trapping, owing to a curious habit it has of making dancing-grounds about a yard and a half square, from which it clears every leaf and twig; the Malays erect an enclosure around this space, and entrap the pheasants by means of snares. The peacock is found, but not so plentifully as further north. Of hornbills there are several; there is the rhinoceros hornbill, and several others. Of kingfishers there are eight or nine species: a little one, very much like the European, is found on the lower parts of the rivers; a larger one seems to live in the thick jungle entirely; then there are barbets, broadbills, and sunbirds. Of monkeys, one species of gibbon is found in Johore, a dark variety that varies a good deal in colouring, but is usually dark brown with light hands; it is very shy, and it is not often one gets a glimpse of it. There is one species, perhaps two, of long-tailed monkeys; they go about in flocks. It has an extraordinary wail, beginning in a low key and ending in a regular shriek. The cocoanut monkey is trained to climb trees and pick the cocoanuts, and there is a greenish-grey monkey that inhabits the mango swamps. Butterflies are not very plentiful, and are difficult to obtain save on some open places; in some places in the south of Johore they are plentiful. Everywhere are the cicadas, with their curious cry. Of reptiles

there are a good many, and crocodiles up to 18 or 20 feet in length; on the western coast of the peninsula a large monitor lizard, and a great number of smaller lizards in the jungle—one very handsome species with a fringe down its head, and back brightly coloured, was met with on the Sembrong river. There are a good many snakes, but they are not often met. One or two are very poisonous; one, the hamadyar, is supposed to attack man, but this is a fable. There is a species of cobra, not so deadly as the Indian cobra. There have been very few cases of death from snake-bite in the peninsula. Of the vipers, perhaps one of the most dangerous is of a beautiful colour, black and green—dangerous because it climbs into the bushes and trees and keeps very quiet; one may be within a few inches of it without noticing it.

Mr. W. B. D'ALMEIDA: I have been associated with Johore and Singapore since my boyhood, and know the Sultan, and have a distinct recollection of his father the then Tumungong. I have not been to Johore, though I have coasted along it several times. I am very pleased with the paper I have heard. I look upon it as an inauguration of a new literature on Johore, introduced by Mr. Lake, the Dato Abdul Rahman, and General Feilding. I would make one observation on the Jakuns, whom I saw in Malacca. They were under a Jesuit missionary, who had a mission-house and schools about 15 miles from the town called Maria Pinda, and where he had converted twenty or thirty of them. They were very short people, rather shorter than those described by Mr. Lake, about 4 feet 5 inches. I hope the projected railway will start from Johore and be extended in time to Assam and Calcutta.

Mr. JOHN THOMSON: At this late hour I will only make one or two remarks as briefly as possible. The first is to congratulate Mr. Lake on the very satisfactory result of his exploration of the interior of Johore. I quite agree with General Feilding, and cannot conceive a task more difficult than that of making a survey in a dense Malayan jungle. I have had some experience of the difficulty of penetrating jungles in other parts of the Malay Peninsula. Next, I am surprised at the great progress made since I visited Johore in 1866. At that time there was only a small settlement of native houses bordering the narrow strait that separate the Sultan's territory from Singapore. This is the spot on which the palace and town now stand. The interior was then unknown. I took a photograph of a group of Jakuns, an aboriginal race of the country—a race of the most primitive type, and extremely interesting from an ethnological point of view. Other branches of the same aborigines are found on the mountains in various parts of the peninsula, under different names, all of the Negrito type. The males are short, about 4 feet 8 inches, and females below that average. In the south of Siam I had accounts of similar tribes occupying the mountainous districts above Kamput, a point remote from Johore. The subject of the aborigines is one worthy of fuller investigation. I have to thank Mr. Lake for the pleasure his paper has afforded me.

The PRESIDENT: I am sure the meeting will agree with me, that we have heard a most interesting paper, and that it has been followed by an interesting discussion. There are many points in the paper on which I should have liked to have made some remarks, but at this late hour I must confine myself to asking the meeting to authorize me, which I am sure it will do, unanimously to give its very hearty thanks to Mr. Lake for the paper he has read us.

The Map of Johore.—All the most prominent features in this map have been fixed by astronomical observation. These have been used as fixed points in triangulating the surrounding country, the details

having been filled in with the compass and plain-table. Advantage has been taken of positions previously fixed along the south coast by the Straits Government triangulation of the island of Singapore, and also of the Johore Government Surveys.

RECENT CONTRIBUTIONS TO OCEANOGRAPHY.

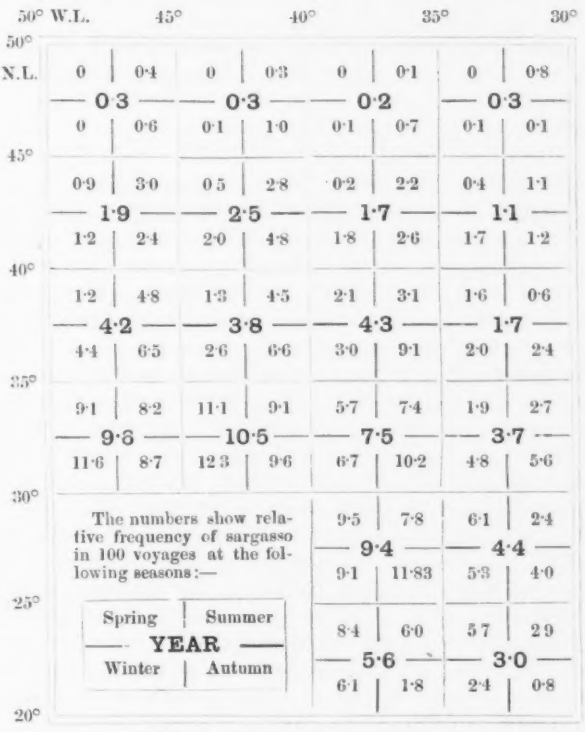
By H. N. DICKSON, F.R.S.E.

The growth of knowledge concerning the depths of the great oceans is necessarily slow and irregular. In the shallower waters near land an expedition combining inquiries into different matters can be carried out with considerable thoroughness, at quite reasonable cost; but in "blue water" the expenditure of time and money involved is usually beyond what can be compassed by those most anxious to carry on the work: scientific research is impossible except to specially organized expeditions, and even these are seldom able to deal fully with more than one class of observations, the others being necessarily left to look after themselves.

Amongst the deep-sea expeditions of recent years, the "Plankton Expedition" of the *Humboldt-Stiftung* must be reckoned of special importance. The work of the s.s. *National* in the Atlantic during the summer and autumn of 1889, is now bearing fruit; and of the five large volumes of results announced, the sections already published include, besides zoological papers, a narrative of the cruise and a report on the meteorological and hydrographical obs ervations, the two last being the work of Dr. Krümmel. The *National* sailed from Kiel on the morning of July 15th, and anchored in the same harbour on 7th November, having traversed a course of 15,000 miles—from the Butt of Lewis to Cape Farewell, Bermuda, Cape Verd Islands, Ascension, Para, Azores, and so home by the English Channel. As the primary object of the expedition was an examination of the Plankton or swimming organisms, the quantitative results of which are graphically exhibited on a map prefixed to the volume, physical investigations could only obtain a secondary place; and the narrative, where not concerned with the description of biological methods and apparatus, deals chiefly with incidents of the voyage and descriptions of the places visited. Of these latter, the accounts given of the Bermudas, of the Cape Verds, of Ascension, of Para and its neighbourhood, and of the Azores, are full of new facts; and the illustrations of persons, places, and things are characteristic to a degree.

In respect of oceanography, however, interest chiefly centres round the description and discussion of the position, form, and extent of the Sargasso Sea. After a review of the earlier accounts given by Theophrastus, Herodotus, and others, touching the existence of drift-weed

beyond the Pillars of Hercules, Dr. Krümmel concludes that the real sargasso was first encountered by Columbus, although the name (*salgazo*) is due to the Portuguese navigator, Oviedo. Various methods of estimating the amount of sargasso weed floating in different parts of the ocean were tried on board the *National*. On the outskirts of the main areas it was possible to obtain results by actually counting the floating bundles, but when these were aggregated by wind and wave into long bands, like stripes of cirrus cloud, it became necessary to make estimations from the amount of area covered and the average density at selected points. By calculating, from the records of sailing ships, the number of times the weed has been encountered in certain five-degree squares, and expressing these as percentages of total voyages across the squares, Dr. Krümmel has been able to draw lines representing the average frequency with which the sargasso occurs in different parts of the Atlantic at each season of the year. The results, reproduced diagramatically in the following table, were first published in *Petermanns Mitteilungen*, in



SARGASSO WEED IN THE NORTH ATLANTIC.

1891. They show conclusively that the bundles of weed are derived from the shores of the Gulf of Mexico, and that their concentration is at least partly due to the Gulf Stream bringing up supplies faster than the drift currents are able to carry them away.

Coming next to the purely physical and meteorological work, contained in the third part of the first volume, we have to regret that the limited time at the disposal of the expedition, and the comparatively slow steaming speed of the *National*, almost entirely prevented the taking of special soundings. A number of temperature observations were made at various depths with a reversing thermometer attached to the dredge rope just above the net, but apart from the inherent uncertainty as to the actual depth of the instrument below the surface, this method can scarcely be relied upon, and at best the result may be taken as merely confirming the work of previous expeditions. Zoological work and surface observations do not, however, mutually interfere, and between air and water the staff of the *National* left but little undone. An important series of observations with a standard anemometer affords, when compared with estimations of wind force, so strong a confirmation of the results of the *Gazelle* expedition, that we may accept the following table as a correct valuation of the numbers of Beaufort's scale :—

Force—Beaufort Scale	2	3	4	5	6	7	8
Wind velocity, miles per hour ...	7·6	11·4	15·9	21·0	26·2	31·8	36·2

Observations of the movements of the upper clouds in equatorial latitudes agree with those discussed by Dr. Gerhard Schott, in the paper noticed below, in showing that the motions of the upper atmospheric currents in those parts are by no means so simple as has been supposed. Between the equator and 10° N. lat. the prevailing direction is undoubtedly westwards, and during the summer months this holds good up to 20° N. lat. During winter, however, the most frequent direction in the higher latitude is with the anti-trade from south-west. Krümmel has shown that between 0° and 10° N. shallow depressions are met with at all times of the year, while between 10° and 20° N. they occur chiefly during the south-west monsoon, and as these depressions move almost invariably westward, he regards the deflection of the cirrus clouds as evidence that they are associated with such cyclonic disturbances. It seems necessary, without entering into a discussion of the question, to accentuate the fact that the true cirrus cloud of the high atmosphere is but seldom observed in low latitudes, and that, as Krümmel remarks, most of the cirriform clouds recorded really belong to the intermediate or anti-trade wind layers.

In another paper Dr. Krümmel discusses first the rain-squalls of the horse latitudes, showing that these are associated with local ascending currents; and second the sea-breeze at Para. In the estuary of the Para, as at Cadiz, the Camaroons, and elsewhere, it is noticed that the sea-

breeze attains remarkable strength at the beginning of flood tide, and especially during springs. As the normal sea-breeze moves considerably faster than any tidal current, it is evident that the increase of its speed cannot be due to a dragging action of the water, but rather to the change of pressure gradients caused by the raising up of the air lying on it. The phenomenon can therefore only occur in large estuaries, where the relative alteration with respect to the land is greatest. It is remarkable in this connection that at Campbeltown and other fishing stations near the entrance of the Clyde Sea Area, there is a popular belief that if the barometer falls quickly during flood tide, and the wind does not at the same time correspondingly increase, there will be no change during the succeeding ebb tide, and the storm may be looked for with the first of the second flood. This is recognized as a quite local peculiarity, and the belief is not current in any other part of the west coast of Scotland.

We may take it that for the present the chief aim of the oceanographer is to extend, and at the same time to simplify, the various methods of tracing the movements of bodies of water in the sea by means of physical or chemical peculiarities observable in the water itself; and the second half of the paper before us contains a masterly review of the present state of knowledge with regard to the examination of sea-waters, as well as important additions to the same. In the matter of temperature observations, Negretti and Zambra's reversing thermometer, especially when mounted in the "Scottish" frame, leaves little to be desired for accuracy or simplicity, and the water bottles of Sigsbee or Mill are trustworthy in action with reasonably smooth seas. Troubles may be said to begin with the examination of the samples collected, and where we are only concerned with means of identification, they centre chiefly round the determination of density or salinity. It may be seriously doubted if the very high degree of accuracy demanded by some investigators is really necessary; certainly any theory of circulation involving accuracy in density determinations to the fifth or sixth place of decimals may well be open to question, and in most cases the differences actually observed are much greater; but it must be admitted that we require to know the fourth place of decimals accurately, and ought to have at least some notion of the fifth, corresponding to about 0·10 part by weight of the total salts contained in 1000 parts of ordinary sea-water, or a difference of 0·1 per mille in the salinity. The method of weighing equal volumes of the sample under treatment and of distilled water in a "pyknometer" is certainly the most correct for direct determination of density, but its use involves considerable time and labour, and is, of course, impracticable at sea. Next in importance comes the hydrometer method, but here difficulties are endless. In order to obtain sufficient sensitiveness, and at the same time to include the whole range of densities met with, it is necessary to have either

some means of varying the weight of one hydrometer, as in Buchanan's *Challenger* type, or to employ a series of separate instruments, as in Dr. Küchler's sets of Kiel hydrometers. In either case consistent results within the limit may be obtained, provided the temperature is fairly steady at the time of making the observations; sets of determinations made at about the same temperature with the same hydrometers give satisfactory comparative information, but considerable difficulty arises in ascertaining the absolute values, and it appears that whatever method is adopted for determining the instrumental constants, these should be fully controlled by experiments with waters of known density. The great source of uncertainty in hydrometer determinations is due to the fact that it is difficult to ascertain the temperature accurately, and almost impossible to keep it constant, and it is necessary to introduce corrections which require a knowledge of the change of volume with temperature of not only the hydrometer, but of the water under examination. The variations of specific gravity with temperature in waters of different salinities have been determined by various experimenters, whose results have recently been subjected to a very searching comparison and discussion by Dr. A. Schück of Hamburg (*Ausland*, 1893, Nos. 40 and 41). Within reasonable limits of temperature and salinity, it seems unlikely that the volume corrections of the water introduce much error, but those of the hydrometer may be another matter. In passing, it seems again a duty to deplore the utter and hopeless confusion in the standards of temperature to which densities are to be referred: different methods undoubtedly adapt themselves best to different standards, and much is got over by the translation into terms of "salinity," but there are limits to the multiplication of results which cannot be compared. Fifteen degrees Centigrade is a convenient working temperature, and dynamical problems demand a recognition of the maximum density point of water —so why not adopt Prof. Pettersson's standard of sea-water at 15° C. referred to distilled water at 4° C.?

Of what may be called indirect methods, that of estimating the total halogen, usually spoken of collectively as chlorine, tends to supersede even the hydrometer in practical work. Amongst its many advantages, the facts that it can be carried out at sea, and that it requires but small quantities of the water samples, are specially in its favour. Given, however, the chlorine in a kilogramme or litre of sea-water, its density and salinity are still somewhat to seek; and here we come upon some of the most important recent work. From an examination of 133 samples, Forchhammer, who may be regarded as *fundator noster* in these matters, concluded that the salinity of any sea-water could be obtained from the chlorine in a kilogramme by simply multiplying the latter quantity by a constant coefficient, *i.e.* that the chlorine was, in all sea-waters, a constant fraction of the whole salts present. Forchhammer fixed the chlorine coefficient at 1·811, and Ekman, Tornöe, Dittmar, and

Jacobsen found approximately the same values. Pettersson, however, in revising Ekman's work, found that if the samples were arranged into groups according to their salinity, the chlorine coefficient was smaller with the higher salinities, and conversely. Dr. Krümmel gives an exhaustive review of existing material from this point of view, and shows that the chlorine coefficient increases with diminishing salinity, at first slowly, and then faster and faster, or, in other words, it is found that chlorine forms a smaller proportion of the total salts the fresher the water. This would indicate that the dilution of sea-water by rivers is accompanied by the addition of a fairly constant proportion of salts, amongst which chlorides occupy but a secondary place; but it may be doubted if this constancy can be sufficiently trusted to allow of the universal application of the new chlorine coefficients. So far, the greater number of determinations have been made with brackish waters from the Baltic, and it would be interesting to see if the same values hold good for estuarine waters generally. The recent analyses of bottom waters by Murray and Irvine (*Trans. R. S. E.* xxxvii. p. 481) certainly show that there are other influences at work tending to alter the ratio of the chlorine to other salts in sea-water, and great caution must be exercised in making any assumptions of a general nature.

In computing *density* from chlorine, we meet the familiar "Dittmar's D," but here in the new form of an equation of the second degree. The advantage of dealing with litres of sea-water instead of kilogrammes is undoubted where volumetric methods are concerned, but this seems to be more than neutralized by the fact that "Chlorine per litre" involves a standard temperature, about which differences of opinion have of course arisen, as well as by the quadratic equation required in any calculation. From the various values for the coefficients in this expression, Dr. Krümmel revises the values of the factor for computing the salinity direct from the density, using different sets of data, and obtains a number practically the same as that of Karsten generally used. It may be noted that the uncertainty in this value is greater than that affecting density determinations of even comparatively modest pretensions.

With the aid of the surface observations made during the cruise of the *National*, Dr. Krümmel has revalued the older data of the surface salinity of the North Atlantic, and a new map is appended to his paper, which he observes resembles Buchanan's *Challenger* chart more closely than it does that published by the Deutsche Seewarte. The most striking feature of the map is the manner in which it shows that the densest surface water is found where evaporation goes on most actively, not where the insolation is strongest.

Among new methods of determining density indirectly, Dr. Krümmel's modification of Abbe's differential refractometer, first tried on board the *National*, promises excellent results. The chief difficulty with this instrument lies in correcting the optical comparison of salt water with

fresh for temperature; a difficulty which, it would seem, might be got over by using salt water of known density as a standard instead of fresh. Practical workers in this field will be glad to know that Dr. Krümmel is developing further improvements in what we may expect to be an invaluable instrument for sea work.

Practically a new departure is made in the application of Forel's "Xanthometer" scale to the observation of the colour of the surface of the sea. Combining the observations of the *National* with those made by Dr. Schott in the voyage already referred to, a chart of the North Atlantic has been prepared, in which the surface is coloured according to the percentage of yellow in the corresponding colours of the scale. Comparing these, which obviously allow of more rigorous treatment than the usual purely descriptive colour observations, with the observations of transparency, Dr. Krümmel concludes that the more transparent the water the purer the blue colour of its surface, and the less transparent, the more the colour tends to green. Dense warm water would seem to be bluer and more transparent, other things being equal, than water not so warm or so dense; but the conditions are so complicated by the number and nature of the solid particles in suspension, that it is extremely difficult to establish any general relations.

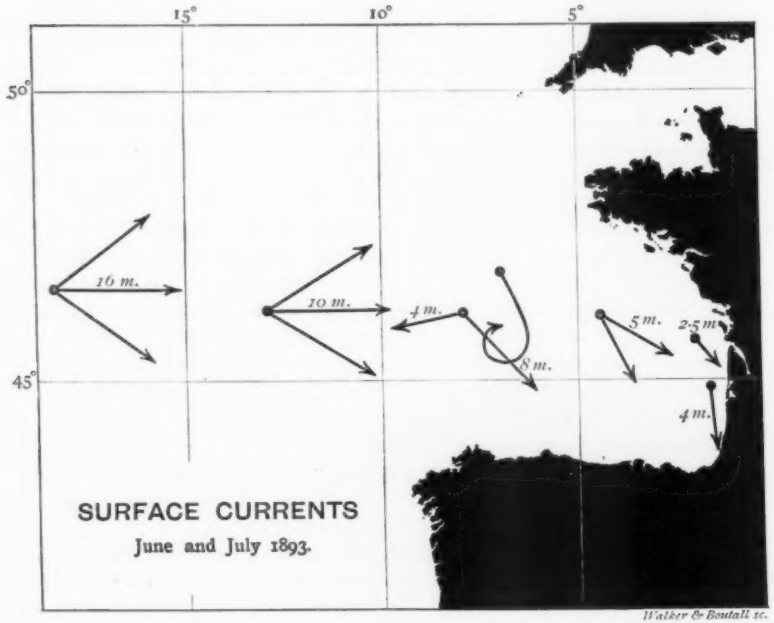
In *Ergänzungsheft* No. 109 of *Petermanns Mitteilungen* Dr. Gerhard Schott gives an interesting, if somewhat diffuse, account of a voyage made by him in 1891 and 1892 to the East Indies and Japan. Dr. Schott's observations were also unfortunately confined to "between wind and water," and in the first half of his paper, which deals exclusively with hydrography, the work is of a similar scope to that of Dr. Krümmel. The chart showing the salinity of the surface waters of the South Atlantic fits in excellently with that of the North Atlantic noticed above, and that of the China Sea and the region between the Indian and Pacific Oceans affords new information of considerable importance. Dr. Schott's observations of surface currents in the higher southern latitudes are of extreme interest, and although some of his conclusions certainly require the support of observations at greater depths, they give further indications of drift currents from a great Antarctic anticyclone.

In the second part of his paper, Dr. Schott describes his meteorological observations, and gives an account of the working of Assmann's aspiration psychrometer on board ship. Some remarkable observations were made on the effects of tropical rains on the sea and air: it was found that even heavy continuous rain altered the temperature and salinity of the surface water but little, while the change of air-temperature was considerable. In a section devoted to the temperature relations of the air and surface water, Dr. Schott confirms the general conclusion that the water is on the whole slightly warmer than the air lying upon it. It would appear, however, that there are important exceptions to

this rule, which Dr. Schott omits to notice. If, for example, we compare the air-temperatures for the North Atlantic in the *Challenger* Report on Atmospheric Circulation with the surface-temperature charts for the same area published by the British Meteorological Office, we find that the air is in many cases somewhat warmer than the sea, answering to the general condition that the usual state of things is reversed where the water is welling up or is part of a cold current. Toynbee, from 25,000 observations, concluded that in the North Atlantic the sea was on the whole warmer than the air in autumn, colder in summer, and that the temperatures were equal in spring.

Considering the numerous difficulties which arise in the course of identifying samples of sea-water from their chemical or physical peculiarities, and the pitfalls which beset any attempt to draw definite conclusions from such identifications, there is much to be said in favour of the old methods of mapping surface currents from the drift of floating objects, whether these be specially prepared floats, as in the investigations of H.S.H. the Prince of Monaco, or derelict ships as tracked by the Hydrographic Office of the United States. The most important recent application of this method is an extension of the Prince of Monaco's "Bottle-chart," by M. Hautreux, vice-president of the Society of Commercial Geography of Bordeaux, who publishes two short papers in the Society's *Bulletin* (Nos. 14–15 and 22, 1893). It has long been suspected that the accepted views concerning a steady northerly current, usually known as Rennell's, moving along the French coast in the Bay of Biscay, were erroneous; and, as M. Hautreux shows, recent research has brought forward no evidence of its existence. Bottles thrown overboard from the Prince of Monaco's yacht while following a course close to the meridian of 18° W. long. drifted invariably southwards of east, and were for the most part found on the Landes coast. To settle the matter, a first series of bottles, numbering thirty-five in all, were supplied to the fishing authorities at Arcachon and to the steamers of the Messageries Maritimes sailing from Bordeaux. These were put overboard at distances of 10 to 100 miles from land during June and July, and twenty-one were recovered, all on the Landes coast. Taking account of wind and tide, M. Hautreux found that the rate of motion diminished as the land was approached, varying from 5 to 6 miles per day 100 miles out to 1 mile and under close inshore, and that the motion was more southerly near the head of the gulf; also that the greatest number of bottles came ashore at spring tides. We reproduce a chart showing the general results. Continuing the investigation during August, September, and October, it was found that with the more variable winds the movements of the bottles were extremely erratic. Only about one-fifth of those put into the sea were recovered, and, although some were found to the north of their starting-point, their course had evidently been slow and tortuous. M. Hautreux' investigation has quite disposed of the northerly

Rennell current, and shown that instead of an active division of the drift current from the Gulf Stream in the Bay of Biscay, the water simply loses its proper motion as it approaches the part of the coast bordered by sand-dunes, and follows the prevailing winds, just as it does, for example, on the east coast of Scotland. We may take M. Hautreux' paper as another striking illustration of the variability of surface drift cur-



rents, and of the danger incurred by navigators in trusting implicitly to current charts. One of the leading results of recent oceanographical research is to show that surface drift currents vary in direction and speed almost as widely as do the winds which cause them, and that in different years and different seasons the same parts of the sea may contain water derived from widely different sources.

COUNT SZÉCHENYI'S TRAVELS IN EASTERN ASIA.*

By BARON F. VON RICHTHOFEN.

THE long-expected account of the scientific results of Count Széchenyi's expedition in Eastern Asia in 1877–8 has at last appeared in a form worthy of the workmanship. Three years ago the work was published in the Hungarian language, but its contents remained closed to nations who had a very real interest in the subject-matter. The importance of the expedition has long been known; it is one of the most brilliant undertakings of the last twenty years. Not only did it strike a path through great stretches of country hitherto scarcely trodden, but it had a quite special value in the fact that its purpose was purely scientific, and that among its members were men of scientific competency. Although the expedition did not reach Tibet, the object it originally had in view, this does not detract from its success. For the lines of route which it actually followed were quite as important, from a scientific point of view, as the approaches to the mystical Lama city.

We are told, in words of the deepest sadness, of the gloom which had come over the life of the Count Széchenyi, and which induced him to start on his great undertaking. The early death of his wife, endeared to him by her beauty and by her graces of intellect and thought, plunged him into profound grief. He sought relief in study, and then he formed the plan of a journey into the inner Asiatic "region of silence and solitude." But the journey was not to be one merely of adventure; the writer recalls with pleasure several conversations with the Count, when the latter gave earnest expression to the desire that his expedition might be a means of contributing something great towards the scientific knowledge of the globe. He was successful in engaging companions of tried ability. In the first place, desiring to find out the districts originally inhabited by the Magyar race, he required the help of some one familiar with the languages of Eastern Asia. An able scholar was found in Herr Gabriel Bálint, but unfortunately he was taken ill on the arrival of the expedition at Shanghai, and had to return. Lieut. G. Kreitner, who had been actively engaged at the Military Geographical Institute (Vienna), and was thoroughly versed in all the technique of cartography, undertook the topographical and general geographical work, while Herr Ludwig v. Lóczy went as geologist. The expenses of the expedition, as well as those in connection with the publication of its results afterwards, were borne entirely by Count Széchenyi. The plan was designed on a noble scale, and so it was carried out. The

* 'Die wissenschaftlichen Ergebnisse der Reise des Grafen Béla Széchenyi in Ostasien 1877–1880.' Erster Band. Die Beobachtungen während der Reise mit 175 Figuren, 10 Tafeln und einer geologischen Uebersichtskarte. Nach dem in Jahre 1890 erschienen ungarischen Originale. Wien. Ed. Hölzel, 1893. With Atlas.

Count's own charming personality and his high rank as a Hungarian magnate won him at once success in Peking. Letters of protection and passports were obtained for him, escorts of 4 to 16 men supplied, and often in the far West a grand reception was in readiness for the much-honoured expedition. As no money was spared in its conduct, everything went on without friction or difficulty, except for one slight delay at the end among the Kachins.

The expedition started from Trieste in December, 1877. Some time was passed on the way in India, Java, Hongkong, Shanghai, and Japan; so that it was the 8th of December, 1878, before the expedition actually started from Shanghai and began its special work. They reached Hsi-ngan-fu in the end of January, 1879, Lan-chou-fu on the 20th of February, Su-chau on the 21st of March, where they remained for a month. Then they went on to Tun-hwang-hsien, the most westerly point attained. A stop at Hsi-ning-fu from the 24th of June to the 10th of August was made use of to visit the Koko Nor and the famous convents of the neighbourhood. Then they crossed the Tsinling Mountains by a road hitherto unknown southwards from Tsing-chau, and reached the capital of Se-chwan. On the 11th of October the journey was continued from Ta-tsien-lu to Batang by a route frequently traversed in recent time. From Batang to Ta-li-fu their route diverged in part from that taken by other travellers; but they followed the usual road once more from Ta-li-fu to Bhamo. They arrived at Bhamo on February 18, 1880.

Although new ground was struck for short distances only, there was a decided lack of exact observations for nearly the whole of this route. The journeys made by the present writer in China coincided, too, only in very slight degree with those of the expedition. Plenty of opportunity was therefore offered for new and important research.

Herr Kreitner having published in 1881 a vivid account* of the experiences of the expedition and his own personal impressions of land and people, the authors were enabled, in writing the later great work, to confine themselves to the real subject-matter, which is therefore treated more exclusively than is customary in the reports even of scientific travels. Each of the three members of the expedition has written a separate report following the same line of travel. Yet the three reports do not materially overlap, for each bears clearly the impress of the author's individuality and special domain.

The first part, from the pen of Count Széchenyi himself, is called introductory, and occupies 253 pages. It gives the diplomatic and historical account of the course of the expedition. Only in this part is the complete journey described, from the departure from Trieste to the return. The intercourse with the officials, and the documentary matter

* Kreitner, 'Im fernen Osten,' Wien: 1881.

associated with this, give a distinct character to the account. We are told of the constant hindrances which came in the way of their plan to reach Lassa. Again and again they took it up anew and were prevented. But, looking away from these pages, we read with especial interest the account of the Count's negotiations with the two noble worthies, and really men of no small consequence, Li-hung-chang and Tso-tsung-tang, as well as with the Tsungli Yamen. And we follow with pleasure the attractively written sections on Hsi-ning-fu and the convents of the neighbourhood, the stay at Ching-tu-fu and Ta-tsien-lu, and on the Kachin race, as well as on the hunting expeditions, the observations of animals, and many other subjects. The author has conscientiously avoided everything which belonged to the department of his companions. His criticism of the Mandarins and the people is on the whole favourable, but there are a good many restrictions (*e.g.* p. xxxii. footnote, p. xlvi., and several other places). The summary of the impressions made by the Chinese people on such an experienced traveller is of great value. In the opinion of the writer, the author has formed too low an opinion of the value of the missions (p. lxiv. footnote).

The second part of the work is Herr Kreitner's report. First we get the astronomical determinations of position, 20 lines of longitude and 25 of latitude. The instruments are described and the observations given in full. Comparing these with earlier determinations, it is seen that, with regard to longitude, the figures of the Jesuits, with the exception of their probably less exact measurements in western Kansu, do not differ more from Kreitner's than those made by travellers during the last decade. In the north Kreitner's lines of longitude run from 0 to 17·7 minutes farther east than the lines fixed by the Jesuits, while in Yunnan they are from 7 to 13 minutes farther west; the differences between Kreitner's lines and those of Prjevalski, however, amount to more than a degree. The lines of latitude agree well with those of the Jesuits, within a small figure. The next subject relates to Kreitner's height-measurements. As the siphon barometer got broken in the very beginning of the journey, three aneroids were used, whose correction-tables are given. For comparative points only very distant stations are available at the present time, namely, Shanghai, Rangoon, and Calcutta; hence it is not surprising that the results of different observers vary considerably. Comparing 104 measurements of Gill and Baber with Kreitner's, we find differences up to 165 feet for 39 places, from 165 to 330 feet for 28, from 330 to 660 feet for 30, and of more than 660 feet for 7 places. Still greater are the differences compared with Sosnowski's measurements in Kansu; according to Kreitner, there are 5 places on an average about 790 feet lower, 2 places on an average 570 feet higher, than Sosnowski measured. Thus we see that the measurements of height in western China cannot claim great exactitude; where several are given, however, those of Kreitner merit special consideration. At all events,

his 374 aneroid determinations, and also the numerous trigonometrical measurements of the heights of mountains, give a most important basis for the knowledge of the relative difference in levels. We gather, from the annexed statement of the routes made, that in 269 days of march, 4450 miles were travelled, or 16½ miles on an average per day.

The topographical description of the journey, by Kreitner, furnishes a large amount of new and valuable material, but is apt to be used as a mine of wealth beyond its true value by those who may wish to gather information on special topics relating to the geography of China. Throughout one recognizes the cartographer and military staff-officer, who prefers above all to deal with given lines and positive figures. Each district through which the journey leads is treated at first generally; an effort is made to describe briefly the map of the district such as it is considered to be, and without going into critical details. The Chinese maps are accepted with as much faith as if they were military maps of a European state, and river-basins described in all the minutiæ of their complete development. It reminds one of Ptolemy when the lines of latitude and longitude are given for every little spring of a tributary, however uncertain in its position. In the same bold style, the main roads, bridle-paths, and footpaths, and even the mountains, are described in a few short and pointed sentences. With regard to the mountains, the manner in which they are represented does in several cases not agree with the correct map of the country. The description of the eastern slope of the Tibetan Highlands (pp. 214–217), for instance, does not correspond with the natural relations, as they clearly result from Lóczy's report.

Any separate district having thus been traced in its general outlines, the road which the expedition took through it is then described in detail. And here Herr Kreitner deserves high credit. He proves himself to be a many-sided observer with a thoroughly practical eye. The forms of the ground, the depths of the water, breadth of rivers, the bridges, fields, peculiarities of the inhabitants, the products, and much else, finds full consideration. The writing is completely technical; without unnecessary words, the facts are crowded one after another in a dry sequence. Figures (for the number of the houses, the population of towns, the breadth of valleys, etc.) are constantly given with an accuracy of detail which makes one sometimes doubt of their complete trustworthiness. Here and there some passage of more general interest is interspersed; *e.g.* on the number of inhabitants in China (pp. 226–232), on the road for traffic between Ta-tsien-lu and Lhasa (pp. 258–264), and between Ngan-hsi-fan and Hami (pp. 207–212), on the races of the Kachin and the Shan (pp. 293–297). The question of a railway for each part traversed is also discussed, and in conclusion a great railway plan drawn out for the whole of China (pp. 236–239), even the cost of which is calculated. As the originator of the plan is personally familiar with

a small portion only of the ground included in the projected railway system, the plan is naturally in part chimerical. A railway, for instance, following the Yang-tse-kiang from Ichang-fu to Chung-king-fu would be thoroughly impracticable. On the other hand, it has escaped the author's observation how easily he might have effected a union of the lower Han Valley with Honan-fu, and thus with his North-China Railway.

The most important portion of the whole work is its third part, written by Lóczy, and containing the geological observations. It is also the largest, for it consists of 540 quarto pages. Valuable as the contributions to topography are, they could only in individual cases bring any essentially important new matter. In the case of geological investigation, almost the whole journey offered new ground. There is scarcely another geologist in recent time to whose lot such a wonderfully grand and beautiful area of research has fallen, and Lóczy has proved himself to be the right man for it. Even a rapid glance at the work will suffice to show the hand of an active and keen explorer, capable to grasp clearly the main features and careful in his observations. Very little work had been done here before. At the time of Lóczy's journey, the only available geological work, excepting Pumpelly's, which relates to other parts of the empire, was that of the present writer, published at Shanghai. It contains detailed information on some regions in the middle provinces, Kiangsi and Kiangsu, which Lóczy traversed during the Count's stay in Japan, also on the Lower Han and the interior of the province of Se-chwan. For the written account, the second volume of the writer's work on China, relating to Northern China, could already be used along with the atlas-sheets belonging to it. Although Lóczy himself repeatedly mentions that he based his identifications of the age of the older formations for the most part upon this work, they have been carried out in many cases independently, by means of Lóczy's own collections of fossils (especially from Devonian, Carboniferous, Permotriassic and Jurassic rocks). An important addition to our knowledge consists in the discovery of very thick and widely distributed lake deposits in the north-west, which are proved to be of Pliocene age by the mammalian remains in them. They afford evidence that Tibet possessed in Pliocene time a wealth of extensive lake basins. The writer agrees completely with the view that most of the deposits which he called Lake Loess in Northern China belong to this formation.

High importance is given to the representation of the geographical structure and the tectonic facts, and it is made comparatively easy to understand the ideas of the author by reason of numerous drawings of sections in the text and several plates of sections. We now have before our eyes for the first time the structure of districts which heretofore had been far beyond the horizon of geological knowledge, such as the Nan-shan, the neighbourhood of Koko Nor, or that remarkable highland

region crossed by the road from Ta-tsien-lu to Batang. It might have been expected that the magnificent mountain region which forms the south-eastern part of the great Tibetan highlands would offer an interest equalled by few other parts of the continents. For there the direction of strike followed by the mountains of China (S.W.—N.E.) meets that of further India (N.N.W.—S.S.E. and N.—S.) and of the Kuenlun (W.N.W.—E.S.E.). It is true the problem has not yet been solved, and it forms still one of the grandest tasks for structural geology; but Herr v. Lóczy has certainly succeeded in making important contributions to its solution.

We might refer to many other points of interest and importance if space did allow. It must suffice in this short notice to mention one more of the great merits of the author. He made himself familiar with the literature on the whole south-west of China, more particularly on Yunnan and parts of further India. Its critical examination led him to draw a most interesting delineation of the structure of this part of Asia. Taking a still bolder flight, he undertook to combine all that is known of the geology of China in a "General Map accompanying the Travels of Count Béla Széchenyi," drawn to scale 1 : 5,000,000. To the explanation of this map are devoted the two concluding chapters of the whole work, which treat (pp. 785–821) on the geological history of the inner Asiatic highlands and their tectonic features. While it is delightful to read a representation from such broad aspects, there can be little doubt that many views are not based on sufficiently ascertained facts, and must meet with opposition in the future. The geological map, where it rests on the observations of others, could scarcely keep free from errors. At the same time, these are weaknesses which could not be avoided in the present meagre state of our knowledge. They are far more than outbalanced by the high value of the astonishing number of facts and actual observations which Ludwig v. Lóczy has recorded in this masterpiece of geological work.

The atlas accompanying the work offers, in a series of 15 sheets (scale 1 : 1,000,000) connected by conical projection, a representation of the route of travel and the country adjoining it up to the distance of from 10 to 25 miles on either side. A trained draughtsman had it for his sole business to prepare the geographical maps, an advantage seldom enjoyed by an expedition. The Military Geographical Institute in Vienna undertook the printing, and the originator of the expedition has devoted large sums of money to the execution of this part of the work. We are therefore justified in expecting a brilliant result; and indeed, as regards technical workmanship, Kreitner's maps are far ahead of all others existing hitherto of those regions. Great care has evidently been devoted to the topographical delineation. It appears, however, that the surveys have not been of equal exactness in every part. The writer had an opportunity of testing the accuracy of the river-drawings

only in two places on the basis of his own surveys, namely, in the course of the Han, between Hankow and Hsiang-yang-fu, and on the Kia-ling-kiang, near Kwang-yuen-hsien, and he must express his regret that in either case Kreitner's delineation does not bear minute criticism. In spite of this, there is a very marked advance in the drawing of the river-systems compared with Chinese representations. The Chinese map has been used, naturally enough, for the indication of the courses of rivers beyond the districts actually surveyed. But it cannot be approved that the river-courses taken from this source of information should have been drawn with the same firm lines as those based on careful surveys by excellent travellers, such as Gill or Baber. In the drawing of the mountains, a distinction has been made between the observed and the doubtful, and in this respect the maps are in advance of those of the writer. The orographical technique is admirable; but there prevails a tendency to represent all mountain scenery on a certain elegant pattern which is captivating to the eye, but does not suffice for the accurate expression of the very varied character of the inequalities of the soil. To take one example—the great scenic contrast remains unexpressed between the table-land of the inner basin of Se-chwan and its wild mountain surroundings. And if the orographic drawing be compared with the coloured geological picture, it is at once evident that the two have been prepared by different hands. The harmony between the inner structure and the surface relief appeals to us only in extreme cases of contrast, such as mountainous and flat country. Apart from those failings, the whole series of topographical maps forms undoubtedly a great help to our knowledge of the surface of China. The fifteen sheets of geologically coloured maps are throughout a new contribution to science. What has been said of Herr Lóczy's text applies equally to them, and not too much praise can be bestowed upon his conscientious work.

It is much to be regretted that the spelling of the geographical names on the maps and in the text has not been carefully carried out according to a particular system. This is no doubt owing to the early departure of Herr Bálint. As a Chinese scholar accompanied the expedition, he ought to have been directed to put down the names of all the places along the course of their route in Chinese characters, and it would have been a simple matter afterwards to transcribe the names according to some uniform system. But Herr Kreitner wrote the names according to their sound, and thus the very basis of correctness is wanting, namely, a fixed standard of transcription. The precise system used is of little consequence; the main thing is that the same written sign and the same sound shall be represented every time by the same syllable. As this has not been done, the use of the work is rendered difficult. Improvements have already been introduced in the text. Herr v. Lóczy gives himself considerable trouble in this direction. He has, moreover,

declared his intention of publishing at the conclusion of the work a comparative list of place-names, which will put things right with the geographical nomenclature.*

While the reviewer dared not neglect to mention some of the failings of the work, he fully appreciates its far greater excellences. He can realize how much it has gained for science, and with all the more enjoyment as it forms an immediate connection with his own observations. More than many others, he has reason to be grateful to the noble-minded originator of the expedition, and to those who devoted their powers to it, for what they have done to enrich our scientific knowledge of Eastern Asia. Inner Asia has been in recent times traversed in many directions. We admire the spirit of enterprise, the energy and perseverance of the travellers. Many among them have materially increased the knowledge of the forms of the surface, of the animal world, and of the inhabitants; but if one might venture to weigh the value of the individual expeditions against one another according to the total amount of scientific work done, there could be scarcely a doubt that a place in the highest rank is due to the expedition of Count Béla Széchenyi.

THE PAMPAS.

By P. KROPOTKIN.

In a paper, recently contributed to *Petermanns Mitteilungen* (vol. xxix 1893, 10, 11), Prof. Bodenbender gives some data relative to the pampas in the east of Córdoba, which, apart from their direct interest, throw some light on the very difficult and much-debated question as to the origin of pampas, steppes, and prairies generally. This question has lately been discussed a good deal, especially since Nehring came forward with his theory of a post-glacial steppe period in Middle Germany.†

The same question has not ceased to occupy Russian explorers since the times of Ruprecht and Chaslavsky; and the works of Beketoff, Kuznetsoff, and Krasnoff, among botanists; Barbot-de-Marny and the staff of the Geological Survey, among geologists; and Prof. Dokuchaeff, among the explorers of the soils of Russia, have thrown upon it a good deal of new light. Without attempting, however, to sum up in this notice the just-mentioned researches, it is worth while to mention one point, at least, in which Bodenbender's researches meet those of the Russian explorers.

In a previous work,‡ Prof. Bodenbender has shown that the structure of the pampa deposits at the foot-hills of the Cordillera, where they are seen alternating with other deposits in the valleys, may give a clue to

* 'Verhandl. des X. Deutschen Geographentages zu Stuttgart,' 1893, p. 207.

† Nehring, *Ueber Tundren und Steppen der* Jetzt- und Vor-Zeit. Berlin, 1890.

‡ *Bolletin de la Academia Nacional*, t. xii.; also *Petermanns Mitt.*, 1891.

the origin of the former. He has proved, moreover, that the surface of the sandstones and conglomerates, upon which the pampa deposits rest, is not so even as might have been supposed on looking at the immense flat surfaces which now stretch before the eye in the prairies. Depressions and river-channels, quite different from the present ones, have been discovered, hollowed in the underlying rocks, and it appears that the rivers of our own time follow them only in their upper courses, while the lower parts of the old valleys have been entirely silted up by the deposits of the rivers themselves. Accordingly, the thickness of the pampa deposits varies greatly, attaining as much as 170 to 200 feet, and perhaps even 260 feet (about Córdoba), without, however, increasing further east. It is also worthy of note that the same clayey and sandy deposits, characteristic of the pampas, penetrate into the valleys of the Cordilleras, and cover such high plateaus as the Pampa de San Luis (5280 feet) and the Pampa de Pocho (3300 feet).

The materials of which the pampa deposits are composed are considered by Bodenbender as of glacial origin. True, that no polished and striated rocks have yet been discovered, either in the Argentine Cordilleras or in the main chain in the latitude of Córdoba; but the region has never been carefully explored for this purpose, while on the other side, Prof. Moreno has described undoubtedly morainic deposits on the borders of the Mendoza Cordillera, and Bodenbender himself has found the same at the foot of the Cebro del Plata. He therefore considers it highly probable that parts of the Argentine territory have been glaciated; and that the Loess and the thick layers of the pampa formation have been derived from the old moraines. The finest sand and mud, of which the latter is composed, have been deposited, partly by the agency of the wind and partly by the rivers during their inundations.

All the present river beds are of a relatively modern origin, and one may see still how they have originated from successions of lagunes, or elongated lakes. The present gradient of the Argentine rivers is certainly small, but is greater than it had been supposed to be. Thus, on the first two miles after its issuing from the mountains, the Rio Primo has a fall of 0·015, which decreases to 0·0025 above Córdoba, and to about 0·0014 in its lower course. Similar figures have been found for the Rio Secundo, Tertio, and Quarto. It is evident, moreover, that in previous times, before the rivers had silted up their lower courses, their gradients must have been still steeper, and this is confirmed by the larger size of the shingle in the older gravels.

At the present time the whole of the surface of the plains is dotted with countless elongated depressions and channels, which are known under the names of *arroyos* (streams), *canaverales*, and *cañadas*.* Those

* It is known that the steppes of South Russia are also dotted with similar depressions, which play such an important part in the life of the steppe as reservoirs of moisture.

depressions are so slight that they can easily be overlooked—with no slight inconvenience if this happens in railway building—but they are mere remnants of much larger depressions which existed in times past, and have been filled up since, partly with dust transported by wind, and partly with the loam deposited over their grassy surfaces by inundations. This levelling process—so characteristic of the South Russian steppes as well—is continually going on nowadays, so that even the slightest depressions of the surface gradually disappear. Even now, inundations play an important part in that process, and one may easily guess the part they have played in times past, when the channels of the rivers were less deeply cut into the plains than they are now. Thus, in 1888, the inundation in the southern part of the Rio Quarto district extended for nearly five hundred miles south of the Arroyo S. Catalina, so that Rio Quarto and Rio Quinto nearly joined together, to form one common basin; and the inundation of 1891 also was on the same grand scale.

Prof. Bodenbender's remarks concerning the part taken by rivers in the formation of beds of Loess and similar "Steppe formations," fully confirm the conclusions arrived at by the Russian explorers. It is known that both in Europe and North America the Loess appears as an outer fringe around formations, the glacial origin of which is no longer a matter of doubt for most geologists. In North Germany, such a fringe stretches west to east at the northern foot of the Harz, the Thüringerwald, the Erzgebirge, and the Riesengebirge, and it is precisely from this belt that a post-glacial vegetation bearing a Steppe character has been described by Nehring.* In the steppes of South Russia the Loess occupies a broad belt between the morainic deposits of Middle Russia and the Black Sea. In Turkistan, as is so well seen on the geological map of Prof. Mushketoff, a Loess belt fringes the outskirts of the highlands and follows the foot of the chains of the Tian Shan system; while in China the Loess belt follows the foot of the south-eastern slope of the Central Asian plateau, and the same formation reappears again on the north-western slope of the plateau in Siberia.

Altogether an intimate connection between the Loess and glacial deposits is thus fully established, and the most accredited opinion among geologists is, that this sandy loam must have originated from the finest particles of mud and dust contained in the glacial beds, and carried away either by the agency of wind or by that of water. Richthofen's hypothesis, according to which wind has been the chief agency in accumulating beds of Loess, has much to be said in its favour, and it has found by this time many adherents, especially in western Europe; but several Russian geologists, who have had splendid opportunities for exploring the Loess where it comes in contact with the

* See the map of Dr. Ernst H. L. Krause, in *Globus*, 1894, No. 1, 'Die Steppenfrage.'

glacial deposits and penetrates in the shape of islands into their midst (as is the case in the depression of Nizhni Novgorod), or appears interstratified with them, are more inclined to favour the fluviatile origin of the Loess and similar steppe formations. The ice-cap which covered Russia, almost as far south as Kiev and Kharkov, and crept still further south into the basin of the Don, must have given origin to numberless streamlets, heavily laden with mud, which must have spread that mud over the tundra-like and, later on, grassy plains of South Russia, both at the time of the greatest glaciation and while the ice-cap was thawing and retreating. The rivers of the time had not yet dug out their channels; they were then, as many of them are still, what Peschel used to describe as "young" rivers, flowing in yet unsettled channels, and periodically inundating immense areas. Such inundations, when they have been spreading over surfaces covered with a thick grass vegetation, undoubtedly must have given origin to an unstratified formation of sandy clay, very similar to what we see now as Loess. This view, as just seen, would thus find a further confirmation in Bodenbender's observations. It may also be added that a formation, almost quite similar to the Loess, is formed under our very eyes in the middle parts of the Amur, where, after having issued from the Little Khingan, it flows through wide prairies to join the Sungari. The soil of the prairies on the banks of the two rivers, in the just-mentioned parts of their courses, as well as the soil of the countless islands which are continually formed and destroyed by the great inundations taking place during the period of the great summer rains, are (if we take into account the difference of the formations supplying the mud) very similar to the Loess, and the inundations evidently do not prevent a flora and a fauna, which bear a great resemblance to the flora and the fauna of the steppes, thriving upon these prairies.

At any rate, whatever use the geologist may make of Bodenbender's observations, they are very interesting in themselves, as they complete our knowledge of the geography of the pampas.

DR. CVIJIĆ ON THE PHENOMENA OF LIMESTONE REGIONS.

Under the general designation *Karst-phenomena*, physical geographers in Germany include a variety of land-surface features, all characteristic of limestone regions, which, when the features in question are present, are known as "Karst-regions." To bring together in one comprehensive view the main facts relating to these is the object of a monograph by Dr. Jovan Cvijić, which forms one of the *Geographische Abhandlungen* edited by Professor A. Penck, of Vienna. The author has himself studied the subject in the *Karst* regions of East Servia and the shores of the Adriatic

in Istria, Montenegro, etc., from which, therefore, the bulk of the illustrations are taken.

The chief features of such limestone regions are those known as *karren*, *dolinen*, blind valleys, and *poljen*. The *karren*, or surfaces composed of blocks of limestone separated by narrow fissures, are dealt with very briefly, much having already been written about them. The writer's conclusions are that they occur in regions composed of pure limestone, and where the surface is least protected from chemical erosion by water. The *dolinen* (called by English writers swallow-holes, sink-holes, or cockpits) are rounded hollows varying from 30 to over 3000 feet in diameter, and from 6 to 330 in depth, great numbers often occurring in a limited space. They may be either dish, funnel, or well-shaped, according to the varying proportion between depth and diameter, though other forms also are found. Some have bare floors, but they are more often covered with the product of decomposition of the limestone (called *terra rossa*), which is of importance as affording almost the only soil fit for cultivation in some districts. Besides the simple basins, the *dolinen* also occur in the form of chimneys, communicating below either with blind cavities, or with underground river-courses or systems of fissures, the first being known in France as *avens*, and the second in Jamaica as *light-holes*. The last to be mentioned are those occurring in alluvial soil, which are caused by a sinking of the latter into clefts in the rock beneath.

The old idea (not, however, held by many English geologists), that these hollows are originated by a falling in of the roofs of underground cavities, is thought improbable by the writer (except in isolated cases), although it has found favour with some recent investigators. His reasons are—(1) the supposed instances have always been hollows in alluvial soil, and not in the rock itself; (2) the greater number of *dolinen* have no connection with such cavities; (3) where they do lead to caverns, there is nothing to prove that they were originated by a falling in of the roof, the connecting passage being often extremely narrow; (4) the presence of cones of *débris* in the caverns (which has been thought to support the view in question) may be easily explained otherwise. The true explanation, Cvijić holds, is that which attributes the *dolinen* to the erosive power of the water which sinks down into cracks and fissures of the rock.

The writer next deals with the streams and valleys of *Karst* regions, which differ in many ways from those of other countries. While as a rule the heights of a country are isolated and the valleys connected, in limestone districts the reverse is the case, owing to the frequency of "blind valleys," shut in at the lower as well as the upper end, the water of the streams sinking into clefts in the porous soil. Another type of depression shut in all sides is that of the *poljen* (a Croatian term), which are broad hollows with steep sides, and fairly

level bottoms without definite slope. They may be either dry, periodically inundated, or occupied by lakes, the second class being far the most numerous. The water of inundation is often derived from springs on their floor. The *poljen* occur at low levels, and therefore receive an enormous supply of "ground water," especially at the times of the autumn or winter rains, which the underground outlet cannot carry it off fast enough. The most important point in reference to the structure of the *poljen* is that their axis is usually parallel to the strike of the strata in which they lie.

Dr. Cvijić concludes the treatise with a sketch of the distribution of *Karst* phenomena in the different geological formations.

NORTHERN GREECE.

By DR. A. PHILIPPSON.*

Northern Greece, *i.e.* the land north of the Ambracian and Malian Gulfs, or the provinces of Epirus and Thessaly, forms, in its general characteristics, a connecting link with the districts of the Western Balkan peninsula, which bound it on the north. The difference between the latter and Hellas is very marked, in spite of the slight distance and the agreement in geological structure. The western front of the Balkan peninsula is occupied by a rugged mountain range—Albania. A great number of parallel chains here run in a north-north-west and south-south-east direction parallel to the coast. They are the Dinaric rocky chain, which is continued into Hellas with the same direction of strike and the same rocks. But, whereas in the latter it has been shattered and opened out by the sinking of larger or smaller sections of the range during the Tertiary epoch, in Albania no such shattering has taken place; the range is a continuous mass, difficult of access, and the coasts are uniform and unbroken, no gulf nor wide bay opening a way into the interior. Albania is on this account completely continental, and its inhabitants have never stood in so close a relation to the sea as the Greeks. An extreme climate—sharp frost and deep snow in winter, burning heat in summer—oppresses this inhospitable land, in which a population, robust and energetic, but indisposed to all regular political organization and higher culture, has been settled from the earliest times. Further to the east, in Upper Macedonia, we find, it is true, fertile basins occupying depressions in the range, but they are rarer, and on that account larger, than in Hellas, and intercommunication is impeded by high ranges. There is wanting here, moreover, the diversity, and above all the genial climate, of Hellas. Only the products of Central Europe thrive in the basins of Upper Macedonia, exposed as they are to severe winter cold. What a contrast between these barbarous, trackless, and gloomy lands in the north, and the sunny and diversified fertile lands of Hellas in the south! The coasts of Northern Greece stretch uniformly, and are separated from the interior by mountains. In the south-east alone does the Gulf of Volo penetrate into the interior, and here only do we find a large seafaring population.

Epirus is, like Albania, filled with parallel chains with a north-north-west and

---

* Paper read at the Berlin Geographical Society, January 6, 1894.

south-south-east direction, between which are extensive and fertile longitudinal valleys, which are wanting in Albania. The special characteristic of the climate is the happy mixture of northern and southern peculiarities. On the coast a Mediterranean climate and vegetation prevail. In the interior the winters are still fairly cold—the Lake of Janina (1575 feet) often freezes—but yet milder than in Albania, and the summers are not so dry as in Southern Greece, owing to the frequency of thunderstorms. The rivers of Epirus are, therefore, far more considerable than in other parts of Greece. In the east, towards Thessaly, the mountains crowd ever closer together up to the wild and inaccessible Pindus, hitherto as good as unknown. Eastward of this extends the wide plain of Thessaly, walled round with mountains —in the east, Olympus, Ossa, and Pelion; in the north, the low Kambulic mountains; in the south, Othrys. The climatic conditions are not so favourable here as in Epirus. The severe winter cold banishes hence the characteristic plants of the Mediterranean climate, and the summers are quite as burning hot as in Hellas. The exploration of Greece has, until quite recently, been carried on almost exclusively in the interest of history and archæology. Now, because in this respect Northern Greece is of slight importance, our knowledge of these regions has remained in a very backward state compared with that of Hellas. In the beginning of this century, when the bloodthirsty tyrant Ali Pasha ruled the country with an iron hand, Epirus was visited by quite a number of travellers; but the English archæologist Leake alone substantially promoted the knowledge of the topography of Epirus, while nothing was done for the physical geography. No systematic investigations at all, even with regard to archæology, have been undertaken hitherto in Epirus. The site of the ancient Dodona has been revisited only within the last decade and a half, whilst as to the Pindus range it is even worse. Here only the new Græco-Turkish boundary-line has been surveyed, but nothing but the *line*, the observations scarcely extending a few miles to the right and left of the boundary. Moreover, only one pass over the Pindus, the Zygos or Lakmon pass, has been frequently crossed by travellers. The northern and southern bounding ranges of Thessaly, too, are almost completely unknown. Olympus, Ossa, and Pelion alone have been investigated in respect of geology and botany. It is, therefore, no wonder that the existing maps are extremely inaccurate, seeing that the greater part rests on report only. Even the larger river-courses are laid down very incorrectly, the numerous names of places occur in wrong positions, and the direction of the mountain-chains is not, especially in the case of Pindus, correct even in its outlines. Thus, on the Upper Aspropotamus, several hitherto quite unknown peaks, of over 6500 feet, were found in places where, until now, a broad basin of this river-valley was laid down.

On account of the disturbances from brigands, an escort of soldiers, who must be kept together in quarters, is indispensable for a journey in Northern Greece. But it is of more use still in dangerous neighbourhoods to enter into relations with influential "Friends" of the brigands, and to gain the good-fellowship of the latter, for they even put themselves at the head of the soldiers, and escort the traveller in absolute safety through the districts under their sway, and recommend him in turn to their confederates. In this way Dr. Philippson was able to traverse over 1200 miles, almost constantly on wild mountain paths, without any serious incident.

From Lamia he crossed, with a strong escort, various ridges of the Othrys range, which divides the plain of the Spercheios from the basin of Thessaly, a low, featureless range of serpentine, slate, and limestone. It is almost entirely uninhabited, covered with extensive forests of oak, which harbour abundance of game. The few villages are notorious for their leaning towards brigandage, for from 1829 to 1881 the Græco-Turkish boundary ran over this range. Travelling here was very difficult

owing to the quite unusual quantity of snow, and the bad weather which prevailed throughout all Greece in the spring of 1893. Othrys is joined on the west by a broad slate range, which forms the skirts of the Pindus proper. The deeply cut valleys are a hindrance to progress, in spite of the gentle slopes of the crests. The valley of the Megdova, which forms the boundary with the limestone chains of the Pindus, is one of the finest examples of a hollow of erosion in the world. Repeated heavy snowstorms made it impossible on the 15th of April to penetrate the Pindus range from Karditsa, an animated little town of the Thessalian plain, and therefore an advance was first made hence to Trikala and Kalabaka, on the borders of Macedonia. Two important facts were discovered here. It was found that the Kambulic Hills, which had been usually drawn as a chain stretching east and west, consist of ridges of crystalline schist running south-south-east, and thus belong to the system of Olympus. The range is covered with forest along the course of streams, and the Greek and Turkish boundary posts are the only human habitations. In the second place, it came to light that north of Kalabaka there is a broad gap in the range, filled with gentle hills of horizontal Oligocene marls and sands. It is the country of Chassia, forming an easy gate of entrance to Thessaly. Although the land is not unfruitful, the population is the poorest of all Greece. In spite of the severe winter, they live exclusively in grass-covered huts, which are worse and smaller than those of African savages. This is a result of the excessively grievous conditions of land-tenure, which prevail in all Thessaly with the exception of the higher mountains. The land belongs to great landlords, to whom the cultivators have to pay a great part of their produce, and who perhaps never visit their property, but allow the peasants to be relentlessly plundered by bailiffs. The peasants are therefore sunk into the most extreme poverty, idleness, and apathy; and so Thessaly, highly blessed as it is by nature, which might be the granary of Greece, is an open sore of the land, and the acquisition of this province—the cause which has brought this about—is that which above all has brought Greece to the verge of bankruptcy.

The Zygos pass, which, with its height of only 4900 feet above the sea, as a rule presents difficulties only in the depth of winter, was in 1893 barred to baggage animals, even at the end of April, by the masses of snow. It forms the one line of communication between Thessaly and Epirus, because here only a single crest has to be crossed, the Thessalian Peneios to the east, and the Artimos to the west, passing through all the other chains.

Janina, a dirty, irregular town of 20,000 inhabitants, lies on the large but shallow lake of that name. It has lost much of its commercial importance since the cession of Arta and Thessaly to Greece.

The geological structure of Western Epirus is fairly simple. Long, bare limestone ranges traverse the land in a south-south-east direction, between which the rivers have cut broad longitudinal valleys. In these dwells an energetic, agricultural population, in numerous thriving townships. The extreme north-western part of Epirus, with the river-plains of the Upper Kalamas of Argyro-Kastro and Delvino, is the best peopled and the most fruitful part of the land, and Epirus is far from being so bad as it is painted. It is true it is an excitable race which dwells here, and they are always ready to exchange the plough and shepherd's staff for the musket and *yatagan*. From Janina the traveller proceeded southwards to Arta by the excellent road (omitted on all maps) which connects Janina with its port, Salahora, on the Ambracian Gulf, and along which almost the whole trade of Epirus passes. Here it was absolutely impossible to obtain information about routes and supplies in the Pindus range, for no communication with Thessaly exists at this point across the mountains. The Pindus is an extremely wild and trackless range, although its

height does not exceed 7500 feet. It consists almost entirely of white stratified limestones, which are abruptly folded together in the most pronounced fashion. The rivers have washed out for themselves excessively steep and deep "valleys of erosion" in the folds, which are pressed together so as to form a single mountain mass. The Aspropotamos and all its tributaries run all of them in narrow ravines, which often reach a depth of over 3000 feet, there being never any level bottoms, which might serve the purposes of cultivation and traffic. It is these deep ravines which make the land so extremely impassable, since the mountain crests are not at all exceptionally difficult. As evidences of a former higher civilization, and a more active traffic, one still finds old-fashioned high-arched stone bridges in great numbers. Without them the fording of the rivers is not without danger, since they are continuously filled with felled fir-trunks in rapid descent; for in the mountains, otherwise so impassable, these copious and swift rivers afford the possibility of floating down the felled timber with ease to the sea, whence they are brought to market across the gulf to Patras. This easy transit occasions a heedless plunder of the forests by speculators from Patras and Trikala, who for small sums procure a permit from the government, and with their armed trains of woodcutters take up their abode in the woods, often against the opposition of the inhabitants. In a short time the splendid primeval fir woods, which a few years back clothed the whole of the Pindus, will have disappeared. Then the few cultivable spots in the valleys will be ruined by the flood-waters, and the population, so far as it does not emigrate, will give itself up to brigandage more than ever. Its chief means of support is the rearing of sheep and goats, and the adventurous forays which are made even into the heart of Epirus and Macedonia. From this source many of the people are comparatively well off. They live in large and stately stone houses, in the enjoyment of complete freedom under their chiefs, but entirely without requirements, maize-cakes being as a rule their only food. The supply of the traveller and of his escort of thirteen soldiers involved, therefore, the greatest difficulties.

A quite different race inhabits the northern part of the range, from the district of Aspropotamos to far within the Turkish territory. It is that of the Zinzars, a scattered Wallachian tribe. Here, in the bleakest mountain wilds, one finds large villages and towns, sometimes with over 5000 inhabitants (*e.g.* Metsovo and Syraku), with fine town houses adorned with artistic panelling and elegant European furniture, but without any fields to speak of, or visible means of subsistence. In winter these places are mostly quite deserted, but are filled in summer with a bustling population, many in European dress, and of good manners. A part of these Wallachians are shepherds, who in winter repair with their flocks to the Thessalian plains; others, however, are merchants and innkeepers, who wander away to all parts of the Mediterranean, from Marseilles and Tunis to Syria and the Caucasus. They always know how to make money quickly, and as soon as they consider they have enough, they return for the summer to their mountain home.

Having returned to Arta, Dr. Philippson proceeded to the southern part of the Pindus, which displays the same wild character, and then went by Karpenisi to the coast of the Gulf of Corinth, through the Oxya range adorned with fine beech woods, past the important chain of the Vardussia, for the exploration of which no time was left. The chief result of the journey is the discovery that the Pindus does *not* consist of two large chains which include a broad longitudinal valley of the Aspropotamos, but of a system of several chains crowded together, crossed in a diagonal direction by the Aspros in narrow ravines.

THE KIZIL IRMAK—THE ANCIENT HALYS.*

By LIEUT. MARCKER.

A SURVEY of the lower Kizil Irmak, the ancient Halys, was carried out in the autumn of 1893 by Lieut. Märcker, in company with Herrn von Pritwitz, von Flottwell, and Kannenberg. Of the 280 miles of the course of this stream below the latitude of Angora, only the section from Karghy to Daruchai had been previously laid down with accuracy, while the sections from Osmanjik to Haji Hamza and Duragan to Cheltek were based on the rough route-surveys of Chihachef and Ainsworth, and over 200 miles of the river's course were completely unknown. From Angora the travellers proceeded *viâ* Hassanoghlu to the junction of the Elmadaghchai with the Kizil Irmak over a gently undulating high plain, completely bare of trees. The cultivation of corn is being rapidly developed in this part of Anatolia, in consequence of the making of the railway: the tithes of the Vilayet of Angora brought in 20,000 Turkish pounds more in 1893 than in 1892, in spite of a moderate harvest. At Kalejik the travellers separated and began their surveys in two separate parties, intending to meet again about once a week, in order to connect their route-surveys. North of Kalejik the stream has cut itself a deep perpendicular-sided gorge six miles long, through dark volcanic rocks. Progress in this was possible only along a narrow goat-path. Here, and in eight other places, the travellers discovered rock-tombs, which are ascribed to Paphlagonian rulers, and of which only five groups were previously known. These burial-grounds are always in a prominent and commanding situation, which might be supposed to give the departed a wide view over the country. With the exception of one near Akjalan, which occurs high up in the mountains, they lie in the immediate neighbourhood of the river. In most cases the tombs are cut into an isolated rock, which thus plays the part of a monument. The height of the tomb above the alluvial soil is usually from 16 to 50 feet. They have all an antechamber, often with pillars, whence a low broad passage leads to the tomb proper, which contains one to four compartments. A closer examination of the numerous mountain valleys which debouch on the Kizil Irmak from the Kizdagh between Changri and Iskilib would probably disclose still more tombs of this kind.

Below Hamsale the stream flows through a plain two or three miles wide, which is little cultivated, since the soil contains salt. Below Tozluburun the stream is again hemmed in by a narrow pass, that of Ibik Boghaz. Downwards from this the country assumes a different character: the mountains, hitherto completely bare, acquire a slight covering of oak brushwood and stunted pine woods. At Karaveran the heights bore stately trees, and in the river-valley as far as Osmanjik, the vine was much grown for the preparation of raisins. Northwards from Karaveran the way is at first difficult, afterwards it passes by the hour over a series of long low uniform undulations. In Osmanjik a fine old stone bridge of fifteen arches, built by Bajezid II., leads across the stream. A causeway well suited to purposes of Turkish rule leads from Osmanjik to Haji Hamza along the left bank of the stream, and thence up the valley of the Devrezchai. Its only weak points are its thirteen bridges, now in a state of decay. Haji Hamza, a small town of two hundred houses, is surrounded by a wall dating from the earlier middle ages; its gardens are overflowing with abundance of the finest fruit. An hour's march below the town is the mouth of the large tributary, the Devrezchai. Its valley, from 1½ to 2 miles wide, shut in on the north and south by perpendicular

* Paper read at the Berlin Geographical Society, January 6, 1894.

walls of yellowish-red rock, grows rice, cotton, and vines. Below the village of Daruchai, further progress along the stream was stopped by a gorge 7½ miles in length, the traveller again reaching its banks only in the neighbourhood of the Cherkess village of Alchakh, since the stream makes a wide bend to the north. At Cheltek a good wooden bridge 340 paces long leads across the stream, and below it the river enters a gorge nearly two miles long, which Lieut. von Flottwell traversed by swimming. The section from Cheltek to Bafra, in which the stream crosses the coast range, is in parts very difficult, and had been previously unmapped. Idir is the southern limit of the cultivation of tobacco, which then takes the place of the vine. Here all the Greek villages lay on the heights, the Turkish in the valley, recalling the time of the persecution of the Christians; on the west coast the positions are reversed. The Greek peasants between Samsun and Sinope speak Turkish exclusively, and even among the rich Greek tobacco merchants there are only a few, of the older generation, who are acquainted with Greek. It is only within the last few years that the government has allowed the establishment of Greek schools. At the village of Assar the stream forces its way for the last time through an imposing gorge of rock, where three fine rock-tombs and extensive fortifications are to be seen. Beyond Cheltek the influence of the Black Sea makes itself felt in the form of fogs and increased cloudiness. Bafra, a town of 1900 houses, of which 400 are Greek and 200 Armenian, exports yearly about 7,700,000 pounds of tobacco. It is a rich town, and the Greek quarter contains a number of fine villas. North of Bafra the stream enters the lowland proper. In the environs of the town large meadows, separated by hedges of myrtle bushes, wild roses, and blackberries, extend, sprinkled over with fine oaks and walnut-trees, and enlivened by large herds of horses and cattle, as well as by thousands of wild swans, storks, etc. Further north the fields disappear, and their place is taken by a park-like country with thickets of dwarf oaks, which still further on changes into a broad swampy level with sedge and reeds, grazed over by huge herds of buffaloes. Close beside the stream an impenetrable forest belt of one to two hundred yards in width, resembling the African gallery forests, makes it impossible to follow its course to the mouth. In summer the stream is not navigable below the mouth of the Elmadaghchai even for small boats or rafts, on account of the many rapids. When the water is highest, large boats with corn are said at times to reach Bafra from Kaisarieh. A passage upwards seems impossible on account of the steep slope of the bed, and because towing-paths do not exist along the banks. It is thus not suited to afford a means of communication between the high plains of Central Asia Minor, with their wealth of corn and cattle, and the wood and tobacco producing north coast. In its lower course it actually forms an effectual barrier to intercourse between the districts lying east and west of it.

Between the mouth of the Elmadaghchai and the sea there are five bridges, one an hour's march above Kalejik (of stone), the others at Osmanjik (of stone), below Karghy (of wood), at Cheltek (wood), and at Bafra (wood). The last is destroyed almost every spring by the flood water, and is thus perpetually "in course of construction." There are, besides, six ferries within this stretch of 280 miles. The width of the streams varies in the height of summer between 55 and 330 yards, and the velocity is nowhere under 6½ feet per second, or 4½ miles per hour. The whole district is fairly safe to travel in, the greatest danger arising from the savage shepherds' dogs, which fiercely attack all strangers, and against which only a good riding-whip avails. From Bafra the travellers proceeded through the thickly peopled, well-wooded coast range *viâ* Alacham to Sinope, and thence back to Angora by Duragan, the Kizdagh, Iskilib, and Changri.

THE MONTHLY RECORD.

THE SOCIETY.

The Oxford Geographical Studentship.—The electors appointed by the Royal Geographical Society and the University of Oxford have elected to the annual geographical studentship, instituted jointly by the two bodies, Mr. Charles Raymond Beazley, M.A., of Merton College, Oxford. Mr. Beazley has given special attention to the exploration of the African coast by the Portuguese, initiated by Prince Henry the Navigator, and, with the approval of the Council, he will probably endeavour to carry out investigations on either the east or the west coast of Africa, with a view to throwing further light on the narratives of Portuguese enterprise.

The Society's Prizes to English Training College Students.—The Royal Geographical Society's prizes for proficiency in geography, in the late examination of students in English Training Colleges, have been awarded by the Government examiners as follows:—Male Students (prizes of £5 each): W. B. Alexander, Peterborough Training College; H. Copping, York Training College; E. Lupton, Culham Training College. (Book prizes): C. Gould, Battersea Training College; H. Milnes, Borough Road Training College; W. Pope, Chelsea, Whitehouse Training College; A. Purkington, Homerton Training College. Female Students (prizes of £5 each): A. M. Barnes, Tottenham Training College; D. Capamagian, Stockwell Training College; M. M. Lee, Derby Training College. (Book prizes): J. G. Beckett, Stockwell Training College; E. H. Bowyer, Stockwell Training College; A. J. Stone, Tottenham Training College; A. E. Thompson, Tottenham Training College. In order to adapt these awards to the new arrangements made by the Education Department, there will in future be twenty prizes of £2 each, and twenty certificates without any money award, in each case ten to males and ten to females. The total sum awarded remains the same.

EUROPE.

Origin of the name Vienna.—The origin of the word Vienna, in German Wien, has of late given rise to much discussion. Müllenhoff and Miklosich tried to prove that the names Vindobona, Vindomana, and Vidobomina are the original Celtic forms, and that the word Veduni, of Slav or German origin, is an intermediate link. But Dr. T. R. von Grienberger has recently shown (*Mitth. Geogr. Ges. Wien*, 1893, vol. xxxvi. p. 657) that this is impossible, inasmuch as Vindobona and Veduni, or Wedonb, have no connection with each other. He regards the Celtic Vindobona as a composite name—a view which we find supported by Professor Egli in his great work, 'Nomina Geographica,' he being inclined to regard the word Wien as coming from the composite Celtic place-name Vindobna = White Castle (*vindos* = white, *obna* = castle).

The Area of France.—The Geographical Service of the French army has recently concluded an elaborate remeasurement of the superficial area of France, which was described at a recent meeting of the Paris Geographical Society by General Derrécagaix. The late General Perrier had instituted a measurement on the sheets of the 1:80,000 map by means of planimeters, one year being occupied in measuring the total area, one year in measuring the departments, and a third year in estimating the area of the arrondissements. At General Perrier's death there only remained an estimate of probable errors to complete the work, but when this was gone into it was found that the unequal shrinkage of the paper and certain defects in the planimeters employed seriously vitiated the results. Accordingly, General Derrécagaix and Colonel de la Noë resolved on a complete remeasurement with improved instruments on the copper-plates instead of the printed sheets of the 1:80,000 map. This has now been completed, with the curious result that France has been found to be more than 3000 square miles larger than was previously supposed. The area between successive parallels and meridians of 10′ was calculated on the assumption of the surface being that of Clarke's ellipsoid. For the greater part of the country, 7341 squares, the area was thus calculated without appreciable error, the planimeter being only used for measuring those parts where the 10′ squares were crossed by a sea or land frontier. In the latter case the French portion of the square was first measured, then the oceanic or foreign portion, and finally the entire square. From these successive determinations the probable error was found. The total error in estimating the entire area was less than 124 acres. On the other hand, the physical change of area through coast erosion has to be taken into account; this amounts to a loss of about 75 acres per annum. The area of the whole country from this measurement is 536,891 square kilometres, or 207,301 square miles, which is 3022 square miles more than the less exact measurement of 1883 showed. In 1883 the total area of France was believed to be 130,678,543 acres; the new measurement gives 132,612,076, or 1,933,533 acres more. Amongst other interesting results of the adoption of the new figures is the reduction of the average density of population of France, as estimated at the last census, from 187·8 to 184·9 per square mile.

ASIA.

Survey of Aden.—Since October, 1891, survey operations have been in progress around Aden, the area undergoing mapping being roughly a semicircle with a radius of about 70 miles, described with Aden as a centre, and extending from the coast to the borders of Turkish Arabia. Orders were issued about two years ago for the survey of the peninsula of Aden on the same scale (8 inches to the mile), but financial considerations prevented this from being carried out at the time, though it was set on foot later. The Bombay military authorities have now applied for a survey of the cantonments of Aden on the scale of 24 inches to a mile, and this will probably be put in hand as well. It is much to be hoped that these operations will not be wound up and Captain Wahab's party disbanded without a serious effort being made to survey the protectorate of Berbera and the adjacent towns on the African coast, which are to all intents and purposes dependencies of Aden. The careful determination of some fixed points along this coast, and the extension across the straits of Bab-el-Mandeb of the Aden triangulation, would serve as a valuable point of departure for fresh geographical operations in the Galla and Somali lands.

M. Potanin.—The Russian traveller, G. N. Potanin, has returned to Moscow from his fourth journey to China. The illness, and ultimately the death of his wife, who accompanied him in his previous journeys, as well as in this last, compelled the

indefatigable traveller to stay chiefly in Torsando, and to return to Russia much sooner than he expected. He, nevertheless, has brought back most valuable collections of plants and animals, as well as very rich materials relating to the folk-lore of the inhabitants of the countries he visited.

Coal in Siberia.—It appears, from the geological explorations which have been made in connection with the Siberian railway, that there are several places in the southern parts of the Government of Yeniseisk where brown coal of a pretty good quality may be extracted. The most promising beds are those of Kushun, situated within ten miles from the projected railway station, Esaulova. They contain about 1,000,000 tons of lignite that may be worked; next come those of Antropova, on the Chulin river, and Kubekova, on the Yenisei, 13 miles from Krasnoyarsk.

The Shilka River.—It has been proved by the explorations in connection with the Siberian railway that the Shilka river, which has hitherto been considered as accessible to steamers only as far as Sryetensk, can be easily navigated for another 105 miles, as far as the village of Mitrofanovskaya. The steamer *Kiakhta*, five feet draught, reached this village in 1893, the level of water in the river being not above the average.

A New Map of China.—The Russian *chargé d'affaires* in Korea, M. K. I. Weber, has presented to the Russian Geographical Society the first four sheets of his new map of China, printed at St. Petersburg in two different editions, Russian and English. The author, who has been five years in the diplomatic service in China, Japan, and Korea, and knows the Chinese language well, has spent twenty-seven years upon the compilation of this map. He has collected all possible materials for this purpose, and has submitted them to severe scientific criticism; and, taking advantage of all the recent explorations made by Europeans in China, as well as of all the best Chinese researches, he has compiled the map on a scale of 32 versts (20$\frac{32}{42}$ miles) to the inch. One of the best modern maps of China—according to the *Izvestia* of the Russian Geographical Society—has hitherto been the map of Matusovsky, published in 1888, on the scale of 125 versts (75 miles) to the inch, in his excellent work, 'Geographical Review of the Chinese Empire' (*Geographicheskoye Obozreniye Kitoiskoi Imperii*). This map is a very conscientious work, containing a good deal of new material, worked out by M. Matusovsky, and all the inscriptions of Chinese names on it have been verified by specialists. M. Weber's map is a further step in advance, both by its much larger scale, and by the richness of materials of which the author has availed himself. The first four sheets, which are now published, cover the north-eastern part of the Chinese Empire. The remainder of the map is in preparation.

Botanical Exploration in Sikkim.—A botanical trip, made in 1892 by Mr. G. A. Gammie, assistant in the Government Cinchona plantations at Mungpu, is described in the *Kew Bulletin* (1893, p. 297). The special object was to collect the plants of the temperate and alpine regions, this being the least-known section of the flora, and although Mr. Gammie followed more or less in the footsteps of Sir Joseph Hooker, his journey to some extent supplements the work of the latter. The Singalelah range, stretching southwards from Kinchinjunga, was first visited. This had been crossed by Hooker, whose routes also led parallel to it for considerable distances; but Mr. Gammie was able to follow its crest by means of paths used by shepherds, who pasture their flocks along it in summer. The journey being made in the wet season, constant fog and rain were encountered, and this weather characterized the subsequent journeys also. Characteristic of this range, probably owing to the coolness and moisture induced by the nearness to Kinchinjunga, was the luxuriant growth of rhododendrons, herbaceous plants being comparatively scarce.

The next trip was to the Lachung valley, leading to the Donkia pass. The beginning of this forms a decided boundary between tropical and temperate vegetation. Conifers grow here in great variety. An excursion to the Tankra mountain gave an introduction to the Alpine flora, which is marked by species of Saussurea, etc., growing in dense hemispherical tufts. The Donkia pass was reached, but not crossed for political reasons. Herds of yaks, going to or returning from Tibet by this route, were seen daily; the salt, barley, and blankets of the latter being exchanged for planks, bamboos, rice, etc. A side valley unvisited by Hooker was explored, leading to a pass over the range which bounds Sikkim on the east, and, finally, an excursion was made to the Chola range, east of Tumlung. A collection of 238 packets of seeds, gathered by Mr. Gammie, has been received at Kew.

Changes of Level of Armenian Lakes.—Dr. R. Sieger, of Vienna, finds (*Globus*, 1894, vol. lxv. pp. 73–75), by a comparison of the existing data, that the levels of the Armenian lakes Van and Urmia show periodic changes coinciding with the periods of climatic variations which Professor Brückner has shown to exist on the globe. In the course of the present century the levels of these lakes reached, according to Dr. Sieger, their periodic maxima in the years 1810, 1840–50, and 1876–80. Of Lake Van, it is further shown that on the whole, its level was lower in the first than in the second half of the present century.

AFRICA.

M. Dècle's Journey in Central Africa.—The latest letters received from this traveller (*vid. supra*, p. 60), announce his arrival at the south end of the Victoria Nyanza, after a detention by fever at Tabora, where, he says, the Germans have made praiseworthy progress in the pacification of the country (*Comptes Rendus*, Paris Geog. Soc., 1893, p. 441; and 1894, p. 14). He speaks in high terms of the friendliness of the natives and the healthiness of the country traversed. His route was different from those previously followed, lying to the west of those of Stanley and others, and in the southern half east of that of Speke. It does not seem, however, to diverge greatly from that of Junker in 1886 (*Pet. Mitteil.*, 1891, *map* 13). He reports, from his own observations and from inquiries, that a system of streams, starting from 4° S. lat., unite to form a river named Ikwundo, which is the same that enters Smith Sound as the Isanga, and that the latitude above mentioned is, therefore, the southern limit of the Nile basin. Speke, he says, must have crossed this stream when dry, and so failed to notice it. It may be remarked, however, that the latter does mention a river (the Muingira) as draining into the creek of the Nyanza from some of the districts on his route ("Travels," etc., i. p. 90), but the fact that Junker's map does not mark such a stream seems to show that it cannot in any case be very considerable. The latter traversed the district late in August, Speke in July and August, and Dècle apparently early in September. The French traveller says that the quantities of game seen in the district of Lohumbo surpassed anything he had seen in Africa. A similar abundance is accounted for by Speke by their congregating in the neighbourhood of water.

M. Foureau's Journey in the Sahara.—News has been received in Paris from this traveller, dated December 5, 1893 (*Comptes Rendus*, Paris Geog. Soc., 1894, p. 12). He had then made a rapid survey of the route from El Golea (South Algeria) to Insala, crossing the plateau of Tademait from north to south. He speaks with enthusiasm of the wild beauty of this region, with its steep slopes and fine gorges. The plateau terminates in an abrupt cliff, the southern slopes falling steeply to the region of sand-denes, while to the north they are long and gradual. Owing to this, the wadis which flow to the north have courses of considerable

length, while those to the south are soon lost in the sands. It is a curious fact that the gum-acacias, with which the country to the south is dotted, do not occur at all to the north. M. Foureau was, at the time of writing, about to start for the Tuareg countries.

AMERICA.

Mean Elevation of the United States.—In a pamphlet extracted from the Thirteenth Annual Report of the Director of the United States Geological Survey, Mr. Henry Gannett discusses the average elevation of the United States. The Geological Survey has compiled all available statistics of determinations of height from surveys, railway sections, etc., and utilized them to produce a map of the United States on the scale of 1 : 2,500,000, or about 40 miles to an inch, on which contour-lines are drawn at altitudes of 100, 500, 1000, 1500, 2000, and each thousand feet up to 12,000. The material was of varied value. Many parts can be looked on as correct, being reduced from large-scale surveys; the larger portion may be considered very nearly correct, being compiled from numerous intersecting railway levels. The portions which can only be considered as hypothetical are Northern Maine, the Adirondack region of New York, Central Idaho, the Cascade range, and the Coast range of Washington, Oregon, and Northern California. This map was used for the measurement of the areas included within each successive contour-line, from which the mean height has been deduced on the assumption that the area between any two consecutive contours had the average elevation midway between those contours, or, in cases where the mean range of elevation was very slight, an average was taken of all determinations of altitude. Tables are given of the areas in each state between successive contour-lines, and also of the average height deduced for each state. From these tables it appears that scarcely any part of Delaware, Louisiana, Florida, or Rhode Island exceeds 500 feet in height, the average altitude of these low-lying states being respectively 60, 100, 100, and 200 feet. On the other hand, no part of Wyoming lies so low as 4000 feet; the whole of Colorado is above 3000 feet; and Nevada, New Mexico, and Utah are all entirely above the 2000-feet line. Colorado is on the average the loftiest state, 6800 feet; but it is closely approached by Wyoming with 6700 feet, and Utah with 6100. Eight other states exceed the average for the whole country, which is 2500 feet. These are—New Mexico, 5700; Nevada, 5500; Idaho, 5000; Arizona, 4100; Montana, 3400; Oregon, 3300; California, 2900; and Nebraska, 2600. Thirty-two states have a mean elevation less than 1300 feet. The paper is accompanied by a reduction of the map from which the calculation was made, the elevations on which are shown in shades of brown represented by magnificent colour-printing, and producing an admirable sense of vertical relief.

Early Voyages on the North-Western Coast of America.—Professor George Davidson contributes to the *National Geographic Magazine* a paper read at the Chicago Conference, on the identification of coast features recorded in the narratives of Ulloa, 1539; Cabrillo and Ferrelo, 1542–43; Drake, 1579; and Vizcaino, 1602–3. He finds that the inaccuracies of the earliest discoverers were due to their crude instruments, ignorance of coast currents, errors of judgment in estimating distances, and failure to seize salient features. After pointing out the uncertainty of the observations of latitude taken by early discoverers, who rarely stated it closer than half a degree, except to add that it was "more" or "scant;" and having proved that the average error increased as the latitude increased, Professor Davidson went on to describe the main features of the discoveries of Cabrillo and Ferrelo in 1542. The vessels sailed in company from Cape San Lucas on July 6, and, after skirting the coast for three months in favourable weather, arrived at the eastern

entrance to the Santa Barbara channel on October 10. Professor Davidson has been able, by his unequalled personal knowledge of the whole west coast of America, from Mexico to Canada, to locate every anchorage of the explorers, and all the salient points described by them. When, on November 11, the vessels were under the shadow of the Sierra Santa Lucia, a south-eastern gale separated them for four days. Ferrelo was driven northwards, where he notes the chief landmark—"a point which forms a cape, and it is covered with trees, and it is in forty degrees." This they called Cabo de Pinos, and it is to be identified with the high wooded spur overhanging Fort Ross Cove, in lat. 38° 31′. From this point they returned southwards, "passing by a great gulf, formed by a change in the direction of the shore," which they named La Bahia de los Pinos. The change in the direction of the coast here mentioned, is point Rezes, and the great gulf is that of the Farallones. Ferrelo describes the coast to the south as "very bold. There are mountains which rise to the sky, and the sea beats upon them; they are covered with snow to the summit." They named them Sierra Nevada, and one which projected into the sea they called Cabo de Nieve, placing it in 38° 40′. This snowy cape must be the massive western spur of the mountains on the peninsula of San Francisco; Mount Bache lies east of the cape, in lat. 37° 6½′, and reaches an elevation of 3825 feet. The vessels returned to San Miguel, and remained there until January, when Cabrillo died, after which Ferrelo spent some time beating about among the Santa Barbara islands. In February they again coasted northwards, until they reached a point where the coast turns towards the north-west; this was Point Arena, in lat. 38° 57′. Drake's voyage was not considered, its critical treatment being deferred for a subsequent paper.

Gold Mining in British Guiana.—The proportions which this industry is assuming may be judged from the following figures, which have been supplied by the officer in charge of the district: In 1892, 131,425 ounces of gold were exported, and the output for 1893 was 142,000 ounces. All the gold, so far, has been obtained by alluvial washing, but mining has now been started on quartz reefs in the North-west District, on the Barima, and also on the Demerara rivers. About half of the output for 1893 was obtained from No. 2 District, which comprises the Potaro river, Conawaruk, and other tributaries of the Essequibo river, and gives employment to over 3000 men. The Government has sanctioned a railway to connect the Demerara and Essequibo rivers, so as to avoid the rapids on the Essequibo, and maket he journey from Georgetown to Potaro and Conawaruk a quicker and less dangerous one, and this work has already been commenced.

AUSTRALASIA.

The Elder Exploring Expedition in Australia.—The earlier results of this expedition were noticed at the time (*Proceedings*, 1892, p. 48), and the large-scale maps embodying the surveys have since been commented on (*Journal*, vol. i. p. 552). The final report and full journal of the expedition enable us to add some details respecting the later work done by it. The temporary abandonment of exploration having been necessitated by the failure to find a water-supply at Queen Victoria spring after the southern unknown tract of desert had been crossed from north to south, Mr. Lindsay determined to proceed northwards along the outskirts of settlement in Western Australia, and make another start into the interior from the neighbourhood of the Upper Murchison. Having repaired to the coast to communicate with the authorities at Adelaide, he was unexpectedly summoned thither to consult with them, the result being the decision to abandon the expedition. Meanwhile the long-continued drought broke up, and conditions for exploration

became exceptionally favourable. Mr. Wells, who had been left in charge during the leader's absence, was able to do some valuable work east and south-east of the Kimberley range, travelling 834 miles, and discovering a large extent of pastoral country, equal in value to that now occupied on the Murchison (the valleys consisting of "rich chocolate loam covered with rich stock mulga, acacias, saltbush, and grass"), as well as some auriferous tracts, which should add a stimulus to the settlement of the former. Few natives were met with during the whole expedition. Mr. Lindsay considers that, had the enterprise been persevered in, the remaining exploration of Western Australia might have been easily completed.

The Chillagoe Caves, Queensland.—Mr. Thistlethwayte recently read a paper before the Queensland Branch of the Royal Geographical Society of Australasia, describing a visit he made in the early part of last year to the Chillagoe limestone caves. These caves are distant about 90 miles from Mareeba, the present terminus of the Cairns railway. The first two visited are named with singular inappropriateness Herculaneum and Pompeii, and are distant about one mile in an easterly direction from the crossing of the Zillmanton track over Chillagoe Creek. The Royal Arch cave is about two and a half miles in a south-westerly direction from Chillagoe station. These caves appear to have been formed by the continuous removal of limestone in solution by water, the water finding its way through joints and fissures in the rock, and enlarging these into chambers of various dimensions, and into connecting passages. The caves are in many cases richly ornamented by stalactites and stalagmites of all sizes. In no case do the floors of the caves themselves appear to sink below the general level of the country outside. As a rule, they were perfectly dry, only a small pool of the clearest water being occasionally met with.

POLAR REGIONS.

New American Arctic Expedition.—Mr. Robert Stein, whose proposed exploration of Ellesmereland was referred to in the January number (*Geographical Journal*, p. 62), sends some details of a new scheme for Arctic exploration, put forward by Mr. Walter Wellman, a journalist of Washington. Mr. Wellman has already started for Europe, in order to consult the Arctic authorities in England before proceeding on his journey *viâ* Norway to Spitzbergen. He proposes to land on Dane's Island, at the north-west corner of Spitzbergen, as early in the season as possible. Several attempts have been made by seal-hunters and others to settle on this island, and a house has been built, in which Mr. Wellman intends to store sufficient provisions to serve sixteen men for a year, in case it should be necessary to winter there. He hopes, however, to achieve the object of his journey in a single season, and to return to Norway in October. He will leave two men to guard the depôt, and with the others will push north in aluminium boats of a new design constructed in Baltimore, and so light that each weigh only 400 lbs. Runners are provided, by the addition of which the boats may at once be converted into sledges should ice intervene. By making an early start, Mr. Wellman hopes to avoid the strong southerly drift of the ice which Parry experienced in 1827, when he reached 82° 45′ by sledging over the floe. The greater lightness of the aluminium sledges is expected to make it possible to exceed Parry's farthest, and possibly to reach the pole in one season, or, failing that, to ascertain the character of the region north of Spitzbergen, and discover any islands that may exist. The funds for the new expedition amount to £4000. It is intended to leave the provisions at Dane's Island if they are not required by the party, and, at Mr. Stein's request, an effort may be made to establish a permanent station there. The importance of this rests on the facilities a series of circumpolar stations would give to fresh explorations

by providing alternative lines of return to the explorers, and so obviating the necessity of retreating exactly along the line of advance.

Antarctic Whaling Cruises.—In our last issue (p. 239) we referred to the three Norwegian whalers, *Jason*, *Castor*, and *Hertha*, stating that they had returned to the Falkland Islands. Letters received on the 1st of March extend and confirm the telegraphic communication. The Norwegian sealers arrived at Port Stanley on the 12th of January, from the south. Enormous numbers of seals were seen, but, owing to the broken condition of the ice, it was impossible to secure a catch. Only one sperm whale and about 330 seals' skins were obtained. After discharging their cargoes into the store-ship *Orion*, the vessels took in coals and stores at Port Stanley and sailed again, in the expectation of getting a full ship. The *Orion* will remain until they return again, probably some time in March. She will then take all their cargoes and proceed to Norway, leaving the sealers to winter at the Falkland Islands. These vessels have very considerably extended our topographical knowledge of the Antarctic regions. Dr. John Murray has received a letter from M. Christensen, Norway, which says: "I can now inform you that a letter has arrived from Captain Larsen, of the *Jason*, dated 29th of December, in which he states he has passed along Grahamsland on the east side down to lat. 68° 10′ S. and long. 60° W. So I think he now has a good supply of fossils if you wish some more. One of our other ships has been to 69° S. and further west. Captain Larsen will send me by next mail his day-book, where some more information may perhaps be got, if it is of interest to you. There has hardly been any ice in the Antarctic this year; and he writes that he has discovered some land and islands. As there was so little ice, he could not find seals where he got them last year. The ships have now gone south again, looking for seal and whale." Thus it appears that these vessels have reached a higher latitude in these longitudes by four degrees than any of their predecessors, and their observations will fill an absolute blank on the south polar maps. The latitude attained is the highest ever reached by a steamer in the southern hemisphere.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Sea-Temperature round Scotland.—The *Annual Report* of the Fishery Board for Scotland for last year contains a long report, by Dr. H. R. Mill and Mr. A. J. Herbertson, on the results of physical observations carried on at selected points along the coast. Four stations on the east coast and four on the west are compared for the three complete years, 1890, 1891, 1892, temperature observations having been taken daily, forenoon and afternoon (9 a.m. and 3 p.m.). On the east coast the stations were peculiarly well fitted for observing sea-temperatures unaffected by the proximity of land, two of them being on lightships—the North Carroff Fife Ness, and the Abertay at the mouth of the Tay estuary; and the others lighthouses built on rocks rising abruptly from comparatively deep water—the Oxcar in the Firth of Forth, and the Bell Rock off Arbroath. On the west coast the observations were made from boats in the shallow water of Loch Ryan and West Loch Tarbert, and from the pier-heads at Brodick in Arran and at Ardrishaig. In the forenoon the water was about a degree and a half warmer on the west coast than on the east, on the average for the whole three years; and in the afternoon the contrast was accentuated, as on the west coast the average afternoon temperature was three-quarters of a degree, and on the east coast only half a degree above that of the forenoon. For the three years considered the mean annual water temperature on the east coast was in the forenoon 45·5, 47·5, and 47·7 respectively, and on the west coast 47·5, 48·8, and 49·3. Thus each year was somewhat warmer than the preceding. The average temperature of the water was usually reached in May while rising, and in November while falling. August or September was the month of

warmest water, and February or March that of coldest. The range of temperature between the warmest and coldest months was about 15·5° F. for both coasts, but the range between warmest and coldest days was about 20° for the east coast and 24° for the west. This comparison would be more exact if the western stations had been on the open Atlantic, and so fully comparable with the Bell Rock and lightship observations in the North Sea. The result would probably be to show that the Atlantic water is both warmer all the year round, and changes less between summer and winter than the water of the North Sea. The report gives the results of specific gravity observations at selected stations, but places less reliance upon these than on temperature work. There are also some interesting observations on the transparency of the water on the east coast. In the Firth of Forth the water is clearest along the middle line, but less opaque along the north shore than the south. The opacity is mainly due to mud, in part derived from the river Forth, but partly also from side tributaries and from dust. The muddiness of the water along the southern margin of the Firth about North Berwick and Dunbar is probably to be ascribed to the prevailing south-westerly wind sweeping the earth from the cultivated fields over the edge of the cliffs which line the coast. These results are of considerable interest in physical geography, and may become important in elucidating the movements of fish if the fishery statistics were compiled in accordance with the suggestions derived from the physical work.

GENERAL.

Death of Von Middendorff.—Alexander Theodor Von Middendorff, the well-known explorer of Siberia, died on January 28, at his estate in Livonia. He was born on August 20, 1815, at St. Petersburg, and received his education, first at a St. Petersburg gymnasium, and later on at the university of Dorpat. At the age of twenty-two he obtained the degree of M.D., and went to the universities of Berlin, Vienna, Erlangen, and Breslau, to continue his education. On his return to Russia he was appointed professor at the Kieff University, and had the chance of joining the same year Karl Baer's expedition to Lapland. This journey, under the guidance of the great physical geographer, determined his further career. In the year 1843 he was sent by the Academy of Sciences to explore Northern Siberia, and his first reports upon observations of the temperature of the Earth at various depths in the Sherguin shaft, at Yakutsk, won for him a European reputation. For many years in succession Middendorff continued to work out the many and varied results of his Siberian expedition—geographical, botanical, zoological, and anthropological—which were published in both German and Russian. Besides his life-work devoted to Siberia, Middendorff was for twelve years secretary to the Academy, and published various works, either chiefly zoological, as his papers on the 'Hares,' on the 'Mammoths of Siberia,' on the 'Natural History of the Brown Bear,' on the 'Remains of Labyrinthodonts,' on the 'Problems of Hippology,' etc.; or geographical, as his excellent monograph on the 'Baraba,' and on the 'Northern Branches of the Gulf Stream,' which he wrote after his excursion to the Arctic Sea. He devoted the last years of his life chiefly to agriculture, for which purpose he undertook a special journey to Turkistan, in order to study the intensive agriculture of the Uzbegs.

The Work and the Awards of the Russian Geographical Society.—At the Annual Meeting of this Society, which was held on February 7, reports were read on the expeditions of MM. Roborovsky and Kozlof in Central Asia, M. Obrucheff on the north-eastern border of Tibet, in the Nan-Shan mountains, M. Berezovsky in the north-west part of the Chinese province of Se-chuan, and of M. Potanin on the western border of the same province, where it fringes Tibet.

Work within Russia proper was limited to the expeditions of MM. Istomin and Lyapunoff for the collection of popular songs, and to ethnographical explorations in Western Russia, Novgorod, and Pskov. The measurements of the force of gravity in the neighbourhood of Moscow, as well as of magnetic elements in the neighbourhood of Byelgorod (the seat of the well-known anomaly), have been continued, and the former have been brought into connection with similar measurements by French geodesists. Most valuable geographical explorations have been made by two members of the Society, Baron Toll and Lieutenant Shileiko, in Northern Siberia, on the shores of the Arctic Sea, and in the New Siberia Islands. More than 4600 square versts have been mapped, and the positions of thirty-eight points have been determined from astronomical observations. The great Constantine medal has been awarded this year to Prof. A. N. Veselovsky, for his researches on the domain of Russian literature; the Count Lutke medal has been awarded in V. E. Fuss, for work in mathematical geography. Two large gold medals have been awarded to A. I. Sobolevsky, for researches into the ethnography of White Russia, and to the statisticians who have investigated the conditions of the peasantry in the governments of Irkutsk and Yeniseisk. The chief works published by the Society during the year have been, besides many numbers of the memoirs (*Zapiski*), the two large quarto volumes, 'The Tangut and Tibetan Borders of China and Central Mongolia,' by G. Potanin, one volume of Additions to Ritter's 'Asia,' and 'The Songs of the Russian People, collected in Archangelsk and Olonets.'

French Geographical Congress at Lyons.—The fifteenth annual congress of French Geographical Societies will be held in Lyons in August of the present year, under the presidency of Dr. Hamy. An international exhibition, to be held in the town, will devote special attention to exhibits from French colonies. The Lyons Geographical Society is preparing a special volume dealing with the geography of the surrounding district, the compilations of the various sections being undertaken by specialists.

Rylands on Ptolemy.*—In this sumptuously printed volume the author undertakes an "elucidation" of Ptolemy, whose geography has engaged his leisure hours for many years past. Having given a very readable outline of the rise and progress of cartography prior to the time of Ptolemy, Mr. Rylands seriously sets himself the task of determining Ptolemy's errors. These he traces to four causes: firstly, errors in the itinerary distances; secondly, errors in the accepted results of astronomical observations; thirdly, errors of scale, Ptolemy having assumed a degree to measure 500 stades instead of 600; and, lastly, errors due to the projection upon which Ptolemy is supposed to have plotted his map. As to the first and second sources of error the author frankly admits that no "general principle of rectification can be applied to them." The third source of error has been dealt with before, often in too sweeping a spirit, we conceive, as it disappears altogether wherever Ptolemy was able to make use of trustworthy observations for latitude. The fourth source, that due to an erroneous projection, is now dealt with for the first time, but in no sense can we look upon the author's arguments as conclusive. By combining the errors due to a wrong scale and a faulty projection, the author arrives at the conclusion that a degree on Ptolemy's maps is equivalent to 46 geographical miles. In separate chapters the author deals with the Ptolemaic geography of Great Britain, identifying the Belisama with the Mersey, thus agreeing with Dr. C. Müller, whilst

* 'The Geography of Ptolemy,' elucidated by Tho. Glazebrook Rylands, F.S.A., Dublin: Ponsonby and Weldrick, 1873. Size 12½ × 10 in., pp. xx. and 97; 24 plates. *Presented by the Author.*

differing from most of the earlier commentators, who identified that river with the Ribble. The curious distortion of Northern Scotland he explains by suggesting that Duncansby Head was laid down by Ptolemy in accordance with a longitude obtained by observing an eclipse of the moon. In an appendix the author points out and corrects a corrupt passage in Book vii., c. 6, of Ptolemy's Geography, which deals with the problem of describing the earth within the armillary sphere.

CORRESPONDENCE.

The Height of Peak Godwin Austen, of the Karakoram Himalayas.

THIS peak was first brought to notice, as of very remarkable altitude, in the year 1858, by the operations of the Great Trigonometrical Survey of India. No name having been discovered for it, it was provisionally designated K_2—or No. 2 of the Karakoram range—and it is still very generally known by that designation. But in preparing the final results of the survey for publication, the symbolic numbering of the unnamed peaks of the Karakoram range was altered, to produce continuity of numbering from left to right; and thus, in Synoptical Volume No. 7 of the Survey—which gives the details of the Kashmir triangulation, and was published in 1879—the peak is entered as Karakoram No. 13. Thus K_2 has ceased to be an appropriate name for the peak, and it may well be known in future by the designation Godwin Austen, which was assigned to it some years ago at a meeting of the Royal Geographical Society, in recognition of Colonel Godwin Austen's geographical services in its neighbourhood, and which, though objected to by some persons, has been accepted by various English and German geographers; it is adopted in the excellent Atlas of India which has recently been published by Messrs. W. and A. K. Johnston, and which, for lowness of price and elaboration of detail, is a very remarkable production.

The height first given by the survey to this peak was 28,278 feet, making it the second highest peak in the world whose height had been accurately determined, and about 100 feet higher than the celebrated mountain of Kinchenjunga, which stands at the meeting-point of the borders of Nepaul, Tibet and Sikkim. The final height is given in the Synoptical Volume as 28,250 feet.

In the *Alpine Journal* for last November, Mr. W. M. Conway gives a table of altitudes determined by him in his Karakoram Mountain Expedition, in which he maintains the height of this peak to be only 27,750 feet, as ascertained by himself from a combination of trigonometrical and barometrical observations in the vicinity, with barometrical observations taken simultaneously at two places, Leh and Gilgit, about 150 miles off. In the *Alpine Journal* for February he maintains the accuracy of his determination.

Now, the Synoptical Volume gives the finally concluded height of the peak, and the information that it was determined by observations from nine of the principal stations of the Kashmir triangulation, and the average discrepancy per mile in the lengths of the common sides of the triangles fixing the peak; but it does not give the nine independent determinations of height, as this could not have been done generally throughout the volume without swelling it to inordinate dimensions. Still it is a pity that this was not done for a peak of such importance, which was fixed with special care, by observations from an unusually large number of stations.

In order to place geographers in possession of the exact facts of the case, I have obtained the separate values from India, and give them in the following table.

Height determinations of K_2.

Year and station of observation.	Distance in miles.	Height in feet above sea-level.	Mean heights of groups.
1856. Harámúkh	137	28,294	
1857. Kanúri-Nár.....	114	28,218	28,274
„ Bárwái.....	88	28,259	
„ Thalanka.....	75	28,323	
1858. Marsbála.....	59	28,240	
„ Kastor	63	28,261	28,252
„ Thurigo.....	62	28,254	
1859. Shangrutí	79	28,247	28,233
„ Biáchúthúsa	99	28,219	
		Mean height.....	28,253
		Adopted final value.....	28,250

There can be little doubt that the finally adopted value may be accepted as true within a few feet. It is obviously far more reliable than a result which was obtained from a few days' barometric observations near the peak, combined with corresponding observations taken concurrently at fixed points 150 miles off. The trustworthiness of a height so deduced depends on the barometric variations, occurring at the time of the observations, being of identical magnitude and direction relatively to the mean yearly values, at all the observing stations. This is always assumed to be the case, and when the assumption is true, accurate results are obtained; but it certainly is not always, and probably not very often, true, and it cannot have been in the present instance.

J. T. Walker,
Late Surveyor-General of India.

OBITUARY.

Sir Harry Verney, Bart.

The death of the Right Honourable Sir H. E. Verney on February 12, removed from the Society one of the original Fellows whose name appears on the first list, issued in August, 1830. Now only one remains out of the 460 who joined the Society on its formation sixty-four years ago. Sir Harry was born in December, 1801, and had thus attained the exceptional age of ninety-two years. He was the eldest son of General Sir Harry Calvert, G.C.B., and succeeded to the baronetcy in 1826, assuming the name of Verney in the following year on his succession to the estates of the Irish Earldom of Verney.

He was educated at Harrow and at Downing College, Cambridge, but, leaving the University at a very early age, he entered the army in 1819, and, after being an officer in the 7th Fusiliers and the Grenadier Guards, he retired as a major in 1827. He became a member of Parliament in 1832, and took part in the abolition of slavery, the promotion of railways in England, and many other hotly contested reforms. For over fifty years he sat in nearly every parliament, and in 1885, when he retired from public service in the House of Commons, he was made a Privy Councillor.

As a cultured country gentleman, Sir Harry was at the front in all works,

religious and social. He assisted in the formation of the Royal Agricultural Society in 1838, and lived to be its oldest member, always taking a keen interest in the improvement of agriculture, and fully aware that, despite the present overwhelming importance of mineral and industrial production, the nation must ultimately depend once more on the cultivation of the land.

Although neither an explorer nor a scientific geographer, Sir Harry Verney travelled much, and accumulated a rich collection of interesting curios, which he offered to make over for public use if a local museum were established in Buckinghamshire. He rendered assistance to the Royal Geographical Society both by the part he took in discussions at the evening meetings, and by his long service on the Council, where he occupied a seat for twelve years, during two of which he was a Vice-President.

He was twice married, his second wife being a sister of Miss Florence Nightingale, and herself distinguished as a writer on various subjects, and as editor of the 'Verney Papers.' He was a good landlord, a steady friend, and a genial member of society. His vitality was wonderful, and his health unbroken; within a week of his death he took his usual exercise on horseback, and kept in touch with all the interests of rural life.

At its meeting on February 26, the Council passed a resolution of regret at the death of Sir Harry Verney, and of sympathy with his family.

General Saunders Abbott.

By Major Broadfoot, R.E.

Major-General Saunders Alexius Abbott, who died at Brighton on February 7, aged eighty-two, was fifth son of Henry Alexius Abbott of Calcutta and Blackheath. He had been a Fellow of the Society since 1876. His three soldier brothers each achieved distinction: the late Major-General Augustus received the Order of the Bath for the defence of Jalálábád; the late Major-General Sir Frederick, Kt., C.B., served in Burma, Afghanistan, and the first Sikh war, and was for many years Governor of Addiscombe; and General James, C.B., of Khiva fame, held charge of the Hazára district with such success that its head-quarters, Abbottabad, was named after him.

Saunders Abbott was appointed ensign in 1828, from Addiscombe, where he was a contemporary of the first Lord Napier of Magdála, Sir Robert Montgomery, Sir Henry Durand, and Eldred Pottinger. In 1836 he was appointed to the revenue survey under Henry Lawrence, and some five years' good work in this department may be considered as his contribution to Geographical information. Next we find him on Lord Ellenborough's staff, and present at Firozpur on the historic occasion of the return of our armies from Afghanistan in December, 1842. Soon afterwards he was appointed an Assistant Agent on the north-west frontier, and, with the rest of Major George Broadfoot's assistants, collected supplies for Sir Hugh Gough's army when war became imminent. When the Sikhs crossed the Sutlej, Abbott was sent to the hills to bring reinforcements, a matter of vital importance; he performed this duty so promptly as to secure the thanks of Sir Henry Hardinge, then Governor-General. Three days later (December 21, 1845) he was on Hardinge's staff, which suffered so severely on the hard-fought field of Firozshah. Our advance was made under a storm of grape and matchlock fire, and Abbott's horse fell with two shots through the neck, whilst he himself, immediately on rising, was struck down by three bullets. He thought he was killed, and was surprised to find he could obey when Broadfoot (who was riding between Abbott and Sir H. Hardinge) calmly desired him to get up and come on. With wounds undressed, he continued on the

field that eventful night and during the successful attack next morning, making himself useful on several occasions. After the battle he shared a tent with Sir Herbert Edwardes and Sir Frederick Haines (now Field-Marshal), both of whom were on Gough's staff, and were wounded.

When the war was over, Abbott was employed in a civil capacity in the Punjab and in Oudh, in both of which provinces his work was satisfactory. He left India in 1863, but returned in 1868 for four years, as agent for the Sind, Punjab, and Delhi Railway Company. Since 1873 he found useful employment at home. He took great interest in the meetings of this Society; but as he got older he had by degrees to give up work. He married Harriot, daughter of Dr. J. Johnstone, in 1839; and General and Mrs. Abbott's hospitality has for many years been widely extended. For some time the General has had bad health, and he has depended on his wife's never-failing devotion.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1893-94.

Sixth Ordinary Meeting, February 12, 1894.—CLEMENTS R. MARKHAM, ESQ., C.B., etc., President, in the Chair.

PRESENTATIONS.—*Lord Belhaven and Stenton.*

ELECTIONS.—*Sir Percy Anderson, K.C.B., K.C.M.G., Assistant Under-Secretary for Foreign Affairs; Chas. Arthur Albert Barnes, Assistant Colonial Surveyor to the Gold Coast Colony; William Henry Brittain, President, Sheffield Chamber of Commerce; George Branchett Chace; William Stanley Desborough; John Edwin Hall, B.A.; Charles Heape; Captain Henry Charles Howard (King's Royal Rifle Corps); George Ormsby; H. J. Pearson; D. G. S. Robertson, C.S.I.; Capt. F. E. G. Skey, R.E.; Herbert Warington Smyth; Rear-Admiral Frederick K. Van der Muelen; John Weston.*

The late Sir Harry Verney.

The PRESIDENT said: This afternoon we received the sad intelligence of the death of Sir Harry Verney. He had lived a very honourable and useful life, and was full of years, so that we could not have expected to see him here again, but there are many of us who will regret that his kindly face and genial words will be seen and heard no more among us. He was many years member of our Council, and a very constant attendant at our meetings, and I may add that he was the last but one surviving of the original fellows of this Society.

The Paper read was:—

"Johore." By Harry Lake.

Seventh Ordinary Meeting, February 26, 1894.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

ELECTIONS.—*Captain Arthur Campbell; Rev. William A. Colledge; Edward Foa; Lieut. Fredk. Wm. Green, R.A.; John Robert Harington; Algernon Grundy Hartley, M.A.; Frank Harris; E. C. F. James; Alexander Knox; Eric Heygate-Lambert; James Rennell Rodd; John Benett Stanford; Gerald Henry William; Edwin William Winton.*

The Paper read was:—

"Exploration of the Upper Mekong, Siam." By Herbert Warington Smyth.

Special Meeting, March 5, 1894.—CLEMENTS R. MARKHAM, ESQ., C.B., F.R.S., President, in the Chair.

In commemoration of the Fifth Centenary of the birth of Prince Henry the Navigator, the Father of modern Discovery and modern Geography.

His Royal Highness the Duke of York and His Excellency the Portuguese Minister were present.

The President opened the proceedings by a short address on the career of Prince Henry, and the following gentlemen took part in the discussion: Sir George D. Taubman Goldie; Captain W. J. L. Wharton, R.N.; Charles Raymond Beazley, Esq.; H. Yule Oldham, Esq.; and the Portuguese Minister.

Eighth Ordinary Meeting, March 12, 1894.—The Hon. G. C. BRODRICK, Vice-President, in the Chair.

ELECTIONS.—*C. H. Cowling, B.A., H.M. Inspector of Schools; H. H. P. Deasy, Lieut. 16th Queen's Lancers; Rev. Charles Harris, M.A.; Sir Charles Hunter, Bart.; The Very Rev. Arthur John Maclean, Dean of Argyll; Robert McAuslan; John Ashmead Pruen, M.A.*

The Paper read was:—

"Montenegro and its Border Lands." By W. H. Cozens-Hardy.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By **HUGH ROBERT MILL, D.Sc.**, *Librarian*, **R.G.S.**

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce, Commercial.
C. R. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographic, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
J. = Journal.
M. = Mitteilungen.
Mag. = Magazine.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue, Revista.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

EUROPE.

Austria-Hungary. **Csánki.**

Körösmegye a XV-ik Században. Székfoglaló Értekezés. Csánki Dezsö. Budapest, 1893. Size 9½ × 6, pp. 154. *Map.*

This is a paper by Dr. Csanki on the geography of the district between the rivers Drave and Save, illustrated by a map. It forms the final part of the fifteenth volume of the publication of the Magyar Academy.

Austria—Tyrol. *Z. Ges. Erdk. Berlin*, **28** (1893): 367-392. **Schjerning.**

Der Zeller See im Pinzgau. Von Dr. W. Schjerning in Aachen.

This paper, which is accompanied by a contoured map of the Lake of Zell, will be noticed in the Monthly Record.

British Empire. *J. R. Colonial I.* **25** (1894): 283-303. **Chesney.**

The British Empire. By General Sir George Chesney. With discussion. Suggestions for a form of Imperial federation.

British Fisheries. *Scottish G. Mag.* **10** (1894): 69–81. **Calderwood.**

British Sea Fisheries and Fishing Areas, in view of recent national advance. By W. L. Calderwood. *Map.*

British Islands—Gazetteer. **Cassell.**

Cassell's Gazetteer of Great Britain and Ireland. Being a complete Topographical Dictionary of the United Kingdom. Parts 1—6. London, Cassell & Co. Size 10½ × 7¼. *Price of each Part, 7d. Presented by the Publishers.*

These are the first parts of what promises to be a useful work of reference regarding the British Isles. In addition to an alphabetical list of the Counties, Parliamentary Divisions, Baronies, Parishes, Townships, etc., the present work will describe the physical features of the country, such as mountains and hills (with their altitude), rivers (with their fisheries), waterfalls, bays, capes, lakes, islands, rocks, and shoals; while the antiquities are also to receive considerable attention. Each part contains a map, besides a number of illustrations. A special map of the British Isles is presented with Part I.

British Islands—Rainfall. *J. S. Arts* **42** (1894): 298–309. **Symons.**

Rainfall Records in the British Isles. By G. J. Symons. With discussion.

Danube. *M. G. Ges. Wien. Beilage zu Heft* 8, *Band* **36** (1893). **Trabert.**

Die Cubischen Niederschlagsmengen im Donaugebiete. Von Dr. W. Trabert.

A contribution to Dr. von Lorenz-Liburnau's *Donau-Studien.*

France—Brittany. *Annales G.* **3** (1893–94): 42–63. **Gallouédec.**

Etudes sur la Basse-Bretagne II. La Cornouailles Intérieure. Par L. Gallouédec.

A complete geographical study, illustrated by sketch-maps of the peninsula of Cornouailles in Brittany, physical features receiving most attention.

France—Cette. *B. S. Languedocienne G.* **16** (1893): 147–171. **Malavialle.**

Coup-d'œil sur l'Histoire de la Ville et du Port de Cette par M. L. Malavialle.

France—Liron. *B. S. Languedocienne G.* **16** (1893): 172–175. **Twight.**

La Rivière souterraine du Liron. Par M. E. Twight.

Short account of the exploration of the underground river of the grotto of Liron, on the slope of the Saint-Loup mountain, near Montpellier, with a view and plan.

France—The Causses. **Martel and Gaupillat.**

A miscellaneous collection of pamphlets consisting of reprints of papers already published, dealing with MM. Martel and Gaupillat's underground explorations, chiefly among the Causses of Southern France. *Presented by M. E. A. Martel.*

Greece. *Nouv. Archives des Missions Scientifiques* **2** (1892): 323–376. **Hauvette.**

Rapport sur une Mission Scientifique en Grèce (Septembre-Octobre, 1891) Marathon—Salamine—Platées. Par M. Amédée Hauvette.

Visits to the three famous battle-fields are described, with plans and views. M. Hauvette, having resided in Athens for many years, and travelled largely in Greece and Asia Minor, is able to give a good comparative description of the places he studied.

Ireland and the Armada. *P. R. Irish A.* **3** (1893): 175–217. **O'Reilly.**

Remarks on Certain Passages in Captain Cuellar's Narrative of his Adventures in Ireland after the Wreck of the Spanish Armada in 1588–89, followed by a literal translation of that Narrative. By Professor J. P. O'Reilly.

The notes are mainly concerned with the identification of the places mentioned in the Narrative, the translation of which is very well done.

Messina Strait. *Globus* **65** (1894): 176–178. **Schott.**

Die Meeresströmungen in der Strasse von Messina von Dr. Gerhard Schott. Hamburg.

This account of the tidal currents through the Strait of Messina will be noticed in the Monthly Record.

Montenegro. *Petermanns M.* **40** (1894): 34–41. **Hassert.**

Die Landschaftsformen von Montenegro. Von Dr. Kurt Hassert. *With Geological Map.*

An important paper, the main features of which will be summarized in the Monthly Record.

Montenegro. **Rovinsky.**

Chernogoriya v yeya proshlom i nastoyaschem. Geographie – Istorie – Etnographie – Arkheologie – Looremennoe Polozhenie. [Montenegro, its past and present.] Sostavil P. Rovinsky. St. Petersburg, 1888. Size 9½ × 6, pp. 881. *With a Map.*

Forms vol. 45 of Collections of the Department of the Russian Language and Literature of the Imperial Academy of Sciences.

Russia—Earthquakes. **Mushketof and Orlof.**

Katalog Zemletriasenii Rossiiskoi Imperii. [Catalogue of earthquakes in the Russian Empire.] J. Mushketof and A. Orlof. St. Petersburg, 1893. Size 10 × 6½, pp. 582. *With Diagrams, Illustrations, and Map.*

This work, which forms vol. xxvi. of the Zapiski of the Russian Geographical Society, includes notices of earthquakes in all parts of the world.

Switzerland.

Statistisches Jahrbuch der Schweiz. . . . Annuaire Statistique de la Suisse. Publié par le Bureau de Statistique du Département Fédéral de l'Intérieur. Troisième Année, 1893. Bern, 1893. Size 9½ × 6½, pp. xvi. and 450. *Maps, etc.*

ASIA.

Afghanistan. *J.S. Arts* **42** (1894): 260–274. **Gray.**

Experiences at the Court of Afghanistan. By John A. Gray.

The author, as surgeon to the Amir, had exceptional opportunities of acquiring knowledge of the people of Kabul and its surroundings.

Borneo. *Petermanns M.* **40** (1894): 27–33. **Schneiders.**

Die Südostabteilung von Borneo. Von Bergingenieur Gottfried Schneiders in Aachen.

An orographical map of south-eastern Borneo accompanies this memoir. The geographical observations made will be referred to in the Monthly Record.

Central Asia. **Potanin.**

Tangutsko-Tibetskaya okraina Kitaya i tsentralnaya Mongoliya. Puteshestvie G. M. Potanina, 1884–1886. [The Tanguto-Tibetan borderland of China and Central Mongolia. Journey of G. N. Potanin, 1884–1886.] St. Petersburg, 1893. Vols. 1 and 2. Size 12½ × 9, pp. 568 and 436. *With List of Proper Names, 3 Maps, and 42 Plates.*

Dardistan. **Leitner.**

Dardistan in 1866, 1886, and 1893: being an Account of the History, Religions, Customs, Legends, Fables, and Songs of Gilgit, Chilás, Kandiá (Gabriál), Yasin, Chitrál, Hunza, Nagyr and other parts of the Hindu Kush, as also a Supplement to the Second Edition of the 'Hunza and Nagyr Handbook,' and an epitome of Part III. of the Author's 'The Languages and Races of Dardistan.' By G. W. Leitner. Woking, Oriental University Institute. Size 10 × 6½. *Map and Illustrations. Presented by the Author.*

India—Chin Tribes. **Reid.**

Chin-Lushai Land. Including a description of the various expeditions in the Chin-Lushai Hills, and the final annexation of the country. By Surg.-Lieut.-Colonel A. S. Reid. *With Maps and Illustrations.* Calcutta, Thacker, Spink & Co., 1893. Size 9 × 5½, pp. xii. and 236. *Presented by the Author.*

A timely description of the Chin-Lushai country in the form of a history of the various military expeditions, with descriptions from personal observation of the characteristics and customs of the people.

India—Folklore. *P. R. Irish A.* **3** (1893): 151–169. **Ball.**

On the Volcances and Hot Springs of India, and the Folklore connected therewith. By V. Ball, C.B., LL.D.

This paper bears on the scientific interpretation by travellers of "native report," and in the course of it Professor Ball strongly urges the importance of an elementary training in physical science for all travellers, so that they may be able to describe with some degree of precision any natural feature to which their attention may be directed.

Indian Ports. **Hill and Roberts.**

Tide-Tables for the Indian Ports for the Year 1894 (also January, 1895). Part I. Western Ports (Aden to Pámban Pass). Part II. Eastern and Burma Ports (Negapatam to Port Blair). By Lieut.-Colonel J. Hill, R.E., and E. Roberts, F.R.A.S., etc. Size 6½ × 4½, pp. 1011. *Presented by the India Office.*

India—Railways. **Sargeaunt.**

Administration Report on the Railways in India for 1892–93. By Lieut.-Colonel R. A. Sargeaunt, R.E. London, Eyre & Spottiswoode, 1893. Size 13 × 8½, pp. 244. *Diagram and Maps. Price* 5*s.* 3*d.*

Special notice will be taken of this report.

India—Telegraphs. *J.S. Arts* **42** (1894): 217–233. **Walker.**

Telegraphic Communication between England and India: its present condition and future development. By E. O. Walker.

The paper is illustrated by a sketch map of the main telegraph lines of Asia and Europe.

Indo-China. **Orleans.**

Around Tonkin and Siam. By Prince Henri d'Orleans. Translated by C. B. Pitman. London, Chapman & Hall, 1894. Size 9½ × 6½, pp. xii. and 426. *Map and Illustrations. Price* 14*s. Presented by the Publishers.*

A notice of the French edition of this work appeared in the *Journal* for March, p. 251.

Irawadi Country. **Grey.**

Diary of a journey to the Bor Khamti country, and sources of the Irrawaddy, made by Mr. J. Errol Gray, season 1892–93, from Assam. Size 13½ × 9, pp. 78. *Presented by the Secretary of State for India.*

This important journey was noticed in the *Journal* for March, p. 221.

Korea. **Cavendish and Goold-Adams.**

Korea and the Sacred White Mountain, being a brief account of a journey in Korea in 1891 by Captain A. E. J. Cavendish, together with an account of an ascent of the White Mountain. By Captain H. E. Goold-Adams. *With 40 Illustrations and two specially prepared Maps.* London, George Philip & Son, 1894. Size 9 × 6½, pp. 224. *Price* 25*s. Presented by the Publishers.*

The most original feature in this little book is the series of fine reproductions of native sketches of Korean life, many of them in colours. The journey itself was of short duration, but through very interesting country, and is well described.

Persia. **Browne.**

A Year amongst the Persians. Impressions as to the life, character, and thought of the people of Persia, received during twelve months' residence in that country in the years 1887–8. By Edward G. Browne, M.A., M.B. London, A. and C. Black, 1893. Size 9½ × 6, pp. x. and 594. *Price* 21*s. Presented by the Publisher.*

Mr. Browne, the lecturer on Persian in the University of Cambridge, visited Persia in order to study the intellectual and religious life of the people, with whose mental attitude he shows complete sympathy. Nevertheless many of the brief geographical descriptions are remarkable word-pictures, and the book as a whole gives a view of modern Persia from a standpoint very rarely occupied by an outsider. The quick intuition and poetical character of the people come out characteristically in an anecdote, describing how a Persian who had never before seen a map, expressed regret that Mr. Browne had not a microscope also, so that they could see not only the position of Yezd, but the events which were happening in its streets.

Siberia—Khingan. **Putiata.**

Expeditsia v Khingan, 1891. Opisanie puti sledovanie. [Expedition to Khingan in 1891; a description of the route taken.] D. V. Putiata. St. Petersburg, 1893. Size 8½ × 6, pp. 74. *Maps and Plans.*

Siberia. *Globus* **64** (1893): 319–326, 343–349. **Leder.**

Reise von Irkutsk nach Urga in der Mongolei. Von Hans Leder.

Account of a journey made in 1891, with views of Kiakhta, and other places of interest.

Sikkim. **Gammie.**

Report on a Botanical Tour in Sikkim. By G. A. Gammie. [Vol. I. No. 2 of Records of the Botanical Survey of India.] Calcutta, 1894. Size 10 × 6½, pp. 24. *Presented by the Government of India.*

Will be noticed in the Monthly Record.

Trans-Caspian Region. **[Tarnovski.]**

Obzor Zakaspiiskoi oblasti za 1891 god. [Review of the Trans-Caspian region for 1891.] (Lieut. G. Tarnovski.) Askhabad, 1893. Size 9 × 6½, pp. 392 and Appendices. *Presented by the Author.*

The Appendices contain a list of inhabited places and *auls*, or native villages, in the Trans-Caspian region.

Turkish Arabia. **Cowper.**

Through Turkish Arabia. A journey from the Mediterranean to Bombay by the Euphrates and Tigris Valleys and the Persian Gulf. By H. Swainson Cowper. London, W. H. Allen & Co., 1894. Size 9½ × 6, pp. xx. and 490. *Price* 18*s*. *Illustrations. Presented by the Publishers.*

An account of a journey by a little-known route, which, although making no pretence to scientific accuracy or literary style, will be found interesting by the general reader, and is sure to be useful to later travellers through the same country.

AFRICA.

Algeria and Morocco. *B.S.G. Paris* **14** (1893): 185–222. **Duveyrier.**

De Telemsan à Melila en 1886. Par Henri Duveyrier. *With map of route.*

This tardily-published memoir was read to the Paris Geographical Society in 1887. The route was at first westward, then due north to Chabat-el-Lahab, and thence along the coast to Melilla, a small plan of which is given.

Congo State. *B.S.R. Belge G.* **17** (1893): 543–564. **Francqui.**

Le Bassin Supérieur du Congo, par M. le Lieutenant L. Francqui.

Lieutenant Francqui's account of the geographical results of his Katanga expedition.

Dahomey. *Jahresb. G. Ges. Bern*, **11** (1893): 149–164. **Barth.**

Land und Leute in Dahomey. Vortrag von Herrn Barth.

Record of a visit to Dahomey in 1891.

French West Africa. *B.S.G. Paris* **14** (1893): 223–237. **Gaillard.**

Explorations de la haute Sangha et du haut Oubangui (1891). Par Gaston Gaillard, Administrateur colonial au Congo français.

A short account of the French expedition to the Upper Sangha Basin, in 1891.

Katanga. *B.S.R.G. Anvers* **18** (1893): 36–46. **Cornet.**

Le Sol du Katanga au point de vue agricole. Par M. le Dr. Cornet.

Matabililand. *J.R. Colonial I.* **25**: (1893–94): 50–96. **Colquhoun.**

Matabeleland. By Archibald R. Colquhoun.

Morocco. *B.S.G. Madrid* **33**, *p.* 321, **34**, *pp.* 95 *and* 280, **35**, *p.* 75. **Pezzi.**

Los Presidios Menores de Africa y la Influencia Española en El Rif, por D. Rafael Pezzi.

A very long treatise on Spanish influence on the north coast of Africa, with historical references, and the text of various agreements with the Emperor of Morocco concerning Ceuta, Melilla, &c.

Morocco—The Riff. *Deutsche Rundschau G.* **16** (1894): 193–198. **Rohlfs**

Der Rif. Von Dr. Gerhard Rohlfs.

Nile. *B.S. Khédiviale G.* **4** (1894): 5-43. **Ventre.**
Hydrologie du bassin du Nil. Essai sur la prévision des Crues du fleuve par Ventre-Bey.

Portuguese West Africa. *B. American G.S.* **25** (1893): 512-541. **Chatelain.**
Bantu Notes and Vocabularies. By Heli Chatelain, late U.S. Commercial Agent at Loanda, West Africa. No. 1. The Language of the Bashi-lange and Ba-luba.

The paper includes a grammatical sketch of the Bashi-lange language by Dr. W. R. Summers, a medical missionary, who after being a printer, conjurer, circus agent, and captain in the Salvation Army, studied medicine in New York, and for two years before his death had been an enthusiastic student of the language of the people amongst whom he laboured.

Togo-land. *M. Forsch. Deutschen Schutzgebiet.* **6** (1893): 103-254. **Kling and Büttner.**
Ergebnisse der Forschungsreisen im Hinterlande von Togo 1890 bis 1892 von Hauptmann E. Kling und Dr. R. Büttner. . . .

The description of Captain Kling's journey contains all the particulars of points determined in latitude, longitude, and altitude. In addition there are lengthy discussions by Dr. Büttner and other specialists on the fauna and flora of the regions traversed, a large number of excellent illustrations and a series of maps, the whole forming a valuable and attractive treatise on the geographical conditions of the Togo hinterland.

Tunis. *Nouv. Archives des Missions Scientifiques* **2** (1892): 377-561. **Saladin.**
Rapport . . . sur la Mission accomplie en Tunisie en Octobre-Novembre 1885. Par M. H. Saladin.

A richly illustrated account of ancient architectural features of Tunis dating back to Roman times.

Unyoro. *P.R.S. Edinburgh* **19** (1891-92): 136-192. **Felkin.**
Notes on the Wanyoro Tribe of Central Africa. By Robert W. Felkin, M.D. *With a Plate.*

A brief summary of the geography of Unyoro is given, and a very full account of the character, customs, and language of the people.

NORTH AMERICA.

Canada. **Haultain.**
A Country Walk in Canada. By Arnold Haultain. *From Blackwood's Magazine for January*, 1894.

Newfoundland Banks. *American J. Science* **47** (1894): 123-129. **Upham.**
The Fishing Banks between Cape Cod and Newfoundland. By Warren Upham.

The paper concludes thus: "The Fishing Banks are thus to be accounted, like the fjords of all our northern coasts, the submerged continuation of the Hudson River Channel, and the similar very deep submarine valleys off the shore of California, near Cape Mendocino, to which I have previously called attention, as evidence of a great epeirogenic uplift of the northern part of this continent preceding and producing the Ice-age."

Pacific Coast. *National G. Mag.* **5** (1894): 235-256. **Davidson.**
Early Voyages along the North-western Coast of America. By George Davidson. (Also a separate copy *presented by the Author.*)

A paper read to the Conference of American and European Geographers held at Chicago in 1893. A notice of it will appear in the Monthly Record.

United States—Alaska. *National G. Mag.* **5** (1894): 173-179. **Scidmore.**
Recent Explorations in Alaska. By Eliza Ruhamah Scidmore.

United States—Chicago. **Mayr.**
Wien—Chicago. Eine Urlaubsreise, Rudolf Mayr. Wien, 1894. Size $10\frac{1}{2} \times 7$, pp. 144. *Maps and Illustrations.*

Popular account of the visit of an Austrian tourist to the World's Fair.

United States—Maryland. **Williams and Clark.**

Outline of the Geology and Physical Features of Maryland, with a geological map of the State and 16 plates. By George H. Williams, Professor of Inorganic Geology in Johns Hopkins University, and William B. Clark, Associate Professor of Organic Geology in Johns Hopkins University. Baltimore, 1893. Size 10 × 8, pp. viii. and 68. *Presented by the Johns Hopkins University.*

Contains a chapter on the configuration and climate of the State as well as the geological description, and views of typical scenery.

United States—New York. *American J. Science* **47** (1894): 105–113. **Lincoln.**

The amount of glacial erosion in the Finger-lake regions of New York. By D. F. Lincoln, M.D., Geneva, N.Y.

A contribution to the theory of lake-formation, especially with regard to the part played by glaciation.

United States—Texas. *P. A. Natural Sciences, Philadelphia* (1893): 313–347. **Tarr.**

Notes on the Physical Geography of Texas. By Ralph S. Tarr.

Mr. Tarr writes partly from observation and partly from the study of published works, a list of which is appended to the paper. He traces the evolution of the surface features of the State, showing how the geological succession and the period of successive uplifts determined the present configuration and drainage system. The absence of lakes, esp cially, is explained by the absence of structural features, which might produce them in all except the geologically oldest part of the region, where prolonged river-action has long since drained any that may have been formed. Climatic conditions are considered in relation to configuration.

United States—Washington. **Wickersham.**

Is it Mount Tacoma or Rainier? By Hon. James Wickersham. Tacoma, 1893. Second edition. Size 9 × 6, pp. 34. *Map. Presented by the Author.*

Mr. Wickersham, in this edition of his pamphlet, adds further opinions in favour of reverting to the native name *Tacoma* for the great snow-summit of the state of Washington.

AUSTRALASIA.

Australia. *J.R. Colonial I.* **25** (1894): 225-252. **Shaw.**

The Australian Outlook. By Miss Flora L. Shaw. With discussion.

Miss Shaw is well known as an authority on colonial matters, from her series of letters to the *Times* from South Africa and Australia, which have been republished in book form and noticed in this Journal. The present paper is an attempt to forecast the prospects of Australia from a survey of its present resources and condition.

Fiji. *Scottish G. Mag.* **10** (1894): 120–140. **Thomson.**

The Land of Viti. By J. P. Thomson.

Hawaii. *B.S.R. Belge G.* **17** (1893): 405–436, 565–584. **Du Fief.**

Les Iles Hawaï. Par J. Du Fief.

A general description of the Sandwich Islands.

Kerguelen Island. *Ann. Hydrographiques* (1893): 246-269 **Lieutard.**

Mission aux Iles de Kerguelen, Saint-Paul et Amsterdam. Rapport de M. le Capitaine de frégate Lieutard, commandant l'Aviso-transport l'Eure.

New Guinea, German.

Nachrichten über Kaiser Wilhelms-Land und den Bismarck-Archipel. Herausgegeben von der New Guinea Compagnie zu Berlin. Berlin, Ashe & Co., 1893. Size 10 × 7, pp. 68. *Maps. Price* 3 *marks.*

The official reports of German New Guinea for 1893.

POLAR REGIONS.

Antarctic Research. *Ann. Hydrographie* **21** (1893): 449–467. **Neumayer.**

Die neuesten Fortschritte der Bestrebungen zu Gunsten einer wissenschaftlichen Erforschung der antarktischen Region. Von Dr. Neumayer.

Dr. Neumayer brings together a short account of recent attempts to revive Antarctic exploration, and dwells on the importance of work being done in that direction, incorporating in his article the preliminary reports of Messrs. Bruce and Donald, and a report of Dr. Murray's R.G.S. paper.

Arctic Tides. *T. R. Irish A.* **30** (1893): 325–346. **Haughton.**

On the Tides of the Arctic Seas. Part VIII. On the Tides of Lady Franklin Sound. By Rev. Samuel Haughton, M.D.

The continuation of Dr. Haughton's exhaustive discussion of the tides of the Arctic Seas deals with the hourly observations made on H.M.S. *Discovery* from September 16th, 1875, to March 28th, 1876, while frozen in the ice of Lady Franklin Bay (latitude 81° 45′ N.). The observations are discussed by Fourier's Theorem, in order to show the mean tide-level, the diurnal tide, the semi-diurnal tide, and the tertio-diurnal tide. This paper is published separately, price 2*s*., through Messrs. Williams & Norgate.

Greenland. *National G. Mag.* **5** (1894): 197–234. **Curtis.**

Recent Disclosures concerning pre-Columbian Voyages to America in the Archives of the Vatican. By William Elleroy Curtis.

The Vatican Library was searched in 1892 for any evidence as to the Norse voyages to Vinland being known in Rome before 1492. No such evidence was found, but there were many interesting records of early missions to Greenland, some of which are given in the article and referred to in the Monthly Record.

Greenland. *G. Tidskrift* **12** (1893–94): 149–157. **Garde.**

Dansk Expedition til Sydvestgrønland i Sommeren 1893. Af V. Garde.

Lieutenant Garde gives an account of his work last summer, with a sketch-map showing his journey on the inland ice from a point midway between Ivigtut and Julianehaab, his greatest elevation, about 75 miles from the coast, being 6840 feet.

Greenland. *G. Tidskrift* **12** (1893–94): 158–160 **Knudsen.**

Under Østkysten af Grønland 1893. Ved Kaptajn Ragnvald Knudsen.

Captain Knudsen of the Norwegian sealer *H-kla* succeeded in breaking through the ice-barrier and reaching the east coast of Greenland in 68° 22′ N., the new coast seen being indicated on a sketch-map, which shows a considerable divergence from the provisional coast-line of Greenland in Stieler's *Handatlas*.

Greenland—Eskimo. **Nansen.**

Eskimo Life. By Fridtjof Nansen. Translated by William Archer. London, Longmans and Co., 1893. Size 9 × 6, pp. xvi. and 350. *Illustrations. Price* 16*s*. *Presented by the Publishers.*

This is a translation, modified in places, from the original Norwegian edition which was issued in 1891, and noted in the *Journal*, vol. i., 1893, p. 282. The volume gives a good insight into the general condition of the Eskimo, their habits and mode of life.

Greenland—Umanak Fjord. *Verh. Ges. Erdk. Berlin* **20** (1893): 438–454. **Drygalski.**

Herr Dr. Erich von Drygalski: Bericht über den Verlauf und die vorläufigen Ergebnisse der Grönland Expedition der Gesellschaft für Erdkunde. *Map.*

The preliminary results of the Greenland expedition as here set forth were summarised in the *Journal* for January, p. 47.

Greenland—Umanak Fjord. *Verh. Ges. Erdk. Berlin* **20** (1893): 454–469. **Vanhöffen.**

Herr Dr. E. Vanhöffen; Fruhlingsleben in Nord-Grönland.

Dr. Vanhöffen was the naturalist on the Berlin Geographical Society's Greenland expedition, and he here describes the fauna and flora, both terrestrial and marine, during the spring season at Umanak fjord.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Geodesy.

The Methods and Results of the U.S. Coast and Geodetic Survey as illustrated at the World's Columbian Exposition, 1893. Bulletin No. 29

of the U.S. Coast and Geodetic Survey. T. C. Mendenhall, Superintendent. Washington, 1893. Size 9½ × 6, pp. 39–98.

The exhibits of the Coast and Geodetic Survey at the Chicago Exhibition were popularized by the publication of a number of descriptive leaflets, and these are now put together in a permanent form. The titles of the leaflets are:—The U.S. Coast and Geodetic Survey; Base Apparatus; Triangulation and Reconnaissance; Time, Latitude and Longitude; Gravity; Topography; Hypsometry; Hydrography; Tides and Currents; Description of the C. and G. S. Steamer *Blake;* Magnetics; Chart Publications; Weights and Measures; Model of United States and Alaska.

Gulf Stream. *National G. Mag.* **5** (1894): 161–166. **Libbey.**

The Relations of the Gulf Stream and the Labrador Current. By William Libbey, Junior.

Professor Libbey here explains to the Conference of American and European Geographers, held at Chicago in 1893, the remarkable effect of wind in affecting the line of demarcation between the warm and cold currents off the east coast of the United States, not only at the surface, but to a great depth in the water.

Ocean Depths.

List of Oceanic Depths and serial temperature observations received at the Admiralty during the year 1893 from H.M. surveying ships, Indian Marine Survey, and British Submarine Telegraph Companies. Hydrographic Department, Admiralty. London, 1894. Size 13¼ × 8½, pp. 20 of tables. *Presented by the Hydrographic Department.*

Oceanography. **Mill and Herbertson.**

Report on the Physical Observations carried on by the Fishery Board for Scotland in the Firths of Forth and Tay, and in the Clyde Sea Area, etc. By Hugh Robert Mill, D.SC., and Andrew J. Herbertson. *Plate.* Size 10 × 6, pp. 395–485. *Presented by the Authors.*

An extract from the Report of the Fishery Board for Scotland for the year 1892, which will be referred to in the Monthly Record.

Oceanography. *P.R.S. Edinburgh* **19** (1891-92): 238–242. **Buchanan.**

On some modifications of the Water-Bottle and Thermometer for Deep-Sea Research. By J. Y. Buchanan.

Oceanography. *T.R.S. Edinburgh* **37** (1893): 481–507. **Murray & Irvine.**

On the Chemical Changes which take place in the Composition of the Sea-Water associated with Blue Muds on the Floor of the Ocean. By John Murray, LL.D., and Robert Irvine.

Results of much novelty and interest are here discussed, the fact that active chemical change occurs in the sea-water permeating mud on the floor of the ocean, and the nature of that change, modify several of the theoretical methods of reasoning formerly relied upon in dealing with oceanographical problems.

Physical Geography. *National G. Mag.* **5** (1894): 154–160. **Chamberlin.**

The Relations of Geology to Physiography in our Educational System. By T. C. Chamberlin.

This paper, read to the Conference of American and European Geographers at Chicago in 1893, favours the introduction of the wider science of Physiography for use in schools in preference to the formal study of the special fields of geology and geography.

Position at Sea. *C. R.* **118** (1894): 24–27. **Favé and l'Isle.**

Détermination graphique du point à la mer. Note de MM. Louis Favé et Rollet de l'Isle.

Particulars of a diagram by which altitudes may be worked out without calculation.

Steppes. *Globus* **65** (1894): 1–6. **Krause.**

Die Steppenfrage. Von Dr. med. Ernst H. L. Krause, Schlettstadt.

This paper is illustrated by a map in colours printed in the text, showing the character of the land in North Germany.

GENERAL.

Civilization. *National G. Mag.* **6** (1894): 1–22. **Hubbard.**

Geographic Progress of Civilization. Annual Address by the President, Honorable Gardiner G. Hubbard.

Mr. Hubbard begins a summary of the history of civilization in all parts of the world, with the striking generalization: "If parallels of latitude were drawn around the earth about fifteen degrees north and fifteen degrees south of Washington, the land within those parallels would include all the countries of the world that have been highly civilized and distinguished for art and science. No great people, except the Scandinavians and Scotch, who from their climate belong to the same region, ever existed outside these limits; no great men have ever lived, no great poems have ever been written, no literary or scientific work ever produced, in other parts of the globe." The existence of South Africa, Australia, and New Zealand might seem to justify the insertion of some such modifying clause as "in the northern hemisphere."

Columbus. *National G. Mag.* **5** (1894): 180–186. **Concas.**

The Caravels of Columbus. By Victor Maria Concas.

Captain Concas was in command of the facsimiles of Columbus' ships sent to the Chicago Exhibition, and in this paper he gives a summary of all that is known of the original vessels which composed the exploring fleet.

Columbus. *National G. Mag.* **5** (1894): 187–196. **Ober.**

In the Wake of Columbus. By Frederick A. Ober.

The outline of a book bearing the same title, and describing a search for relics of Columbus in Europe, and visits to the places where the first ships touched in America.

Columbus. **Wieser.**

Die Karte des Bartolomeo Colombo über die vierte Reise des Admirals Von Fr. R. v. Wieser. Innsbruck, 1893. Size 9½ × 6½, pp. 14 and 3 plates. *Presented by the Author.*

This is a reprint from the "Mittheilungen des Instituts für Oesten Geschichtsforschung," and contains facsimiles of the three supposed autograph maps of Bartholomew Columbus which were described in the January number of the *Journal*, p. 44.

Commercial Geography—Index.

Index to the Board of Trade Journal of Tariff and Trade Notices, and miscellaneous Commercial Information. Vols. i. to xiv., July, 1886, to June, 1893. London: Stationery Office, 1893. Size 10 × 6½, pp. 204. *Price* 2*s.*

Although the first word of the Index, "Abolition," is scarcely the heading under which one would look for information as to the close of the commercial tribunals of Italy, this work is of extreme utility to the student of commercial geography, and it is convenient also, the arrangement being mainly geographical.

Educational. **Redway.**

The Status of Geography Teaching. By Jacques W. Redway. [From the *Educational Review*, New York, 7 (1894): 33–41.]

Educational. *National G. Mag.* **5** (1894) 137–153. **Powell.**

Geographic Instruction in the Public Schools, by W. B. Powell.

A paper read to the Conference of American and European Geographers in Chicago in 1893. Mr. Powell elaborates the well-known method of the *Heimatskunde* as applicable in the schools of the district of Columbia.

Educational. *Scottish G. Mag.* **10** (1894) 82–90. **Rousiers.**

The Teaching of Geography and Social Science. By Paul de Rousiers.

M. de Rousiers, acknowledging gratefully the advances recently made in giving life and interest to geographical instruction, points out that this improvement in spirit is apt to be accompanied by a falling-off in the arrangement of text-books, where confusion seems to take the place of order. He recommends, in order to overcome this tendency, the recognition of the relation between physical and social conditions; in fact, a recognition of the principles of geography. This is, however, not the main obstacle to proper instruction in Geography. The real difficulty, in this country at least, lies in the very general ignorance amongst teachers, and the absence of adequate university recognition of Geography as a science.

Fur-Seal. **Chapman.**

Notes on the Depletion of the Fur-Seal in the Southern Seas. By Frederick Revans Chapman. Reprinted from the *Canadian Record of Science*, October, 1893. Size 8½ × 6, pp. 446–459.

A summary of this paper appears in the Monthly Record.

Geography. **Kan.**

De Aardrijkskunde en de Praktijk. Rede op der Verjaardag den Universiteit van Amsterdam, Uitgesproken door den Rector Magnificus. Prof. Dr. C. M. Kan.

This address on practical geography is reprinted from the Year-book of the University of Amsterdam for 1892-93, and deals with the scope and expression of geographical science alike in unravelling the past relations of land and people, and in guiding modern schemes of colonization and the development of new lands.

Historical. **Sacken.**

C. R. Osten Sacken. On the so-called *Bugonia* of the Ancients, and its relation to *Eristalis tenax*, a two-winged insect. Firenze, 1893. Size 9½ × 6, pp. 34. *Presented by the Author.*

Historical Geography. *National G. Mag.* **5** (1894): 125–131. **Parker.**

The Relations of Geography to History. By Francis W. Parker.

Paper read at the Conference of American and European geographers at Chicago in 1893.

Prince Henry the Navigator. *Globus* **65** (1894): 153–156. **Ruge.**

Prinz Heinrich der Seefahrer (geb. 4 März 1394, gest 13 November 1460). Von Professor Dr. S. Ruge. Dresden.

A short historical paper, illustrated by a portrait of Prince Henry.

Year-book—Universities. **Kukula and Trübner.**

Minerva. Jahrbuch der gelehrten Welt. Herausgegeben von Dr. R. Kukula and K. Trübner. Dritter Jahrgang, 1893–94. Strassburg Karl J. Trübner, 1894. Size 6½ × 4½, pp. xvi. and 862. *Price* 6*s.* 6*d.*

A complete list of the *personnel* of all the Universities and higher educational institutions in the world.

NEW MAPS.

By J. Coles, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Publications issued since February 8, 1894.

6-inch—County Maps:—

ENGLAND AND WALES:—**Lancashire,** 66 S.E.; **Yorkshire:**—74 N.W., 77 S.W., 141 S.E., 171 N.E., 210 S.E., 234 S.E., 240 S.W., 264 N.E., 266 S.E., 273 N.W., 275 N.W., 8 E., 282 N.W., 285 N.W., 286 N.W., 287 N.W., 291 S.E., 292 S.W., 300 N.W., 301 N.W., 1*s.* each.

25-inch—Parish Maps:—

ENGLAND AND WALES:—**Lancashire,** XVIII. 1, 4*s.*; XIX. 2, 3*s.*; LXI. 10, 20*s.* 6*d.*; LXII. 13, 4*s.*; LXX. 9, 5*s.*, 11, 4*s.*, 13, 14, 5*s.* each; 15, 4*s.*; LXXIV. 16, 4*s.*; LXXV. 3, 4, 5*s.* each; 5, 8, 4*s.* each; 11, 5*s.*; 12, 16, 4*s.* each; LXXVI. 8, 5*s.*; 11, 14, 4*s.* each; LXXVIII. 1, 3, 5, 4*s.* each; 6, 3*s.*; 7, 8, 9, 11, 12, 13, 15, 16, 4*s.* each; LXXXIII. 1, 8, 5*s.* each; LXXXIV. 1, 4*s.*; 5, 6, 11, 12, 5*s.* each; LXXXV. 1, 9, 4*s.* each; 13, 5*s.*; LXXXVI. 1, 5*s*; 2, 4, 4*s.* each; 8, 5*s.*; LXXXIX. 16, 5*s.*; XCIII. 11, 12, 8*s.* each; XCIV. 5, 7, 11, 14, 5*s.* each; XCVII. 5, 8*s.*; C. 12, 4*s.*; CXI. 3, 5*s.*; 4, 8*s.*; 8, 5*s.*; CXII. 5, 5*s.*; CXVI. 6, 3*s.* **Yorkshire,** XLI. 4, 12; XLV. 4, 7, 4*s.* each; 10, 3*s.*; 11, 12; LVI. 3, 7, 11, 12, 15, 16; LXIII. 7; LXV. 3, 4, 7; LXVI. 1, 2, 5, 6, 9, 10, 13, 14; LXXI. 2, 4; LXXXII. 1, 2, 4*s.* each; 4, 3*s.*; 8, 4*s.*; LXXXIV. 7, 3*s.*; XCV. 12; XCVI. 10; CXXXI. 6, 7, 4*s.* each; 8, 10, 12, 16; CXLVIII. 4, 7, 8, 3*s.* each; 10, 12, 13, 16, 4*s.*

each; CLXV. 1, 4*s.*; 3, 3*s.*; 4, 5, 9, 12, 4*s.* each; 14, 3*s.*; 16, 4*s.*; CLXVI. 3, 4*s.*; 4, 3*s.*; 5, 7, 8, 9, 10, 11, 12, 16; CLXXXIII. 8, 4*s.* each; CCXVI. 2, 5*s.*; 12, 8*s.*; CCXVIII. 1, 20*s.* 6*d.*; CCXXXI. 1; CCXXXII. 3, 5*s.* each; 6, 11*s.* 6*d.*; 7, 8, 5*s.* each; 12, 4*s.*; 13, 5*s.*; 14, 11*s.* 6*d.*; CCLVIII. 15, 3*s.*; CCLXXIII. 2, 6, 4*s.* each; CCXCIV. 12, 8*s.*; 15, 8*s.*; 16, 5*s.* (coloured).

Town Plans—5-feet scale:—

Ashton-under-Lyne and **Stalybridge** (Revision) IV., with houses stippled, 2*s.* 6*d.* Index is not yet published.

Town Plans—10-feet scale:—

Plymouth and **Environs** (Revision), CXXIII. 7—9, 21, 23; CXXIII. 8—16, 17, 18, 19, 21, 23, 24, with houses stippled, 2*s.* 6*d.* each. Index is not yet published.

Miscellaneous Maps:—

Derby and its Environs, special map of; one inch scale. *Price* 1*s.* 6*d.*

Cheltenham and Gloucester, special map of; one-inch scale. *Price* 1*s.* 6*d.* (*E. Stanford, Agent.*)

England. **Bartholomew.**

Environs of Sheffield, scale 4 stat. miles to an inch; with Plan of Sheffield, scale 11·8 inches to a stat. mile.—Warwickshire, scale 4 stat. miles to an inch; with Plan of Leamington, scale 5·6 inches to a stat. mile; and Plan of Warwick, scale 11·3 stat. miles to an inch. W. H. Smith and Son's Series of Reduced Ordnance Maps for Tourists, by J. Bartholomew, F.R.G.S. *Price* 1*s. each. Presented by Messrs. J. Bartholomew & Co.*

Montenegro. **Hassert.**

Die Landschaftsformen von Montenegro von Dr. Kurt Hassert. Petermanns Geographische Mitteilungen Jahrgang, 1894, Tafel 4. Scale 1 : 800,000 or 12·6 stat. miles to an inch. Justus Perthes, Gotha, 1894. *Presented by the Publishers.*

AFRICA.

Egypt. **Egyptian Ministry of Public Works.**

Perennial Irrigation and Flood Protection for Egypt. 19 Plans and Sections. Ministry of Public Works, Cairo, 1894. *Presented by the Egyptian Ministry of Public Works.*

This is a series of nineteen plans, illustrating a system of perennial irrigation and flood protection for Egypt.

West Africa. **Binger.**

Carte du Haut-Niger au Golfe de Guinée par le Pays de Kong et le Mossi. Levée et dressée de 1887 à 1889, par le Capitaine Binger. Nouvelle Edition, mise à jour jusqu'au 1er Mars 1893, à l'aide des travaux topographiques des officiers en service au Soudan français; des travaux du Dr. Crozat du Capitaine Marchand; de la commission de délimination de la Côte d'Ivoire; du Comm^{t} Monteil et des différentes reconnaissances faites sur le littoral du Golfe de Guinée. Scale 1 : 1,000,000 or 15·8 stat. miles to an inch. Service Géographique des Colonies. Paris: Maison Andriveau-Goujon. *Presented by the Service Géographique des Colonies.*

The present edition of this map contains important corrections and additions, and has in many parts been entirely redrawn. Places that appear as blanks on the earlier edition have been filled in, and the positions of many places have been altered as regards latitude and longitude. All available material has been used in the compilation, in addition to the surveys of Captain Binger, and the routes of different travellers are laid down. The importance of towns and villages is indicated by symbols, and the northern limit of dense continuous vegetation is shown. Insets on enlarged scales of the Komoe and Bia rivers, and the lagoons between Lahu and Fresco are given. The map is drawn on a large scale in a very clear style, and is printed in well-chosen colours.

AMERICA.

United States. **Rand, McNally & Co.**

Rand, McNally & Co.'s Indexed County and Township Pocket Maps and Shippers' Guides of Louisiana (1 : 982,080 or 15·5 stat. miles to an inch).

Mississippi (1 : 823,680 or 13 stat. miles to an inch), Missouri (1 : 1,000,000 or 15·8 stat. miles to an inch), Tennessee (1 : 1,143,660 or 18·5 stat. miles to an inch), Texas (1 : 2,217,600 or 35 stat. miles to an inch). Rand, McNally & Co., Chicago and New York. *Presented by the Publishers, through E. Stanford, Esq.*

These are new editions of maps which have been previously noticed in the *Geographical Journal*, and which will be found useful to persons visiting the United States on business or pleasure.

AUSTRALASIA.

Borneo. **Schneiders.**

Der Südosten von Borneo. Nach den neuesten Gouvernements Aufnamen u. eigenem Journal entworfen u. gezeichnet von Gottfried Schneiders. Petermanns Geographische Mitteilungen, Jahrgang, 1894, Tafel 3. Scale 1 : 2,000,000 or 35·7 stat. miles to an inch. Justus Perthes, Gotha, 1894. *Presented by the Publishers.*

New Zealand. **Surveyor-General of New Zealand.**

Map of the Northern Portion of East Taupo County. Scale, 1 : 126,720 or 2 stat. miles to an inch.—Plan of Kawhia, West Taupo, and portion of Clifton Counties. Scale, 1 : 126,720 or 2 stat. miles to an inch. 2 sheets. Photo-lithographed at the Head Office, Department of Lands and Survey, Wellington, N.Z. S. Percy Smith, Surveyor-General. (*Stanford.*)

GENERAL.

The World. **Debes.**

E. Debes' neuer Handatlas über alle Teile der Erde in 59 haupt, und weit über 100 Nebenkarten, mit alphabetischen Namenverzeichnissen. Ausgeführt in der geographischen Anstalt der Verlagshandlung. Leipzig, H. Wagner and E. Debes. Parts III. and IV. 1·80 *marks each part. Presented by the Publishers.*

Part III. contains maps of West and Central Germany, Polynesian Island Groups, and Central America. Part IV. contains a Commercial Map of Central Europe, Countries of the Alps (western part), and Eastern Asia. The maps are excellent specimens of cartography, and contain much information as to the tribes inhabiting certain districts, which is not usually given in general atlases. Each map is accompanied by an index.

The World. **Ravenstein.**

Philip's Systematic Atlas, Physical and Political; specially designed for the use of Higher Schools and Private Students. Containing over 250 Maps and Diagrams, in 52 Plates, with an Introduction and Index of 12,000 names. By E. G. Ravenstein, F.R.G.S. London: G. Philip & Son, 1894. *Price* 15*s. Presented by the Publishers.*

This atlas is intended to fill a middle place between ordinary school atlases and those published for general reference. The atlas is arranged in three main divisions, viz. Mathematical, Physical, and Political Geography. In the Mathematical division, in addition to the usual astronomical diagrams, there is a good general description of the principal map projections illustrated by diagrams, and some useful notes on the scale of maps and the measurement of distances on maps. The second division, Physical Geography, contains maps illustrating distribution of land and water, orography, river-basins, geology, volcanoes, ocean currents, co-tidal lines, temperature of the ocean and salinity of the sea, meteorology, magnetic phenomena, and the geographical distribution of plants and animals. The third division, Political Geography, in addition to general political maps, contains maps showing languages, religions, density of populations, etc.; inset plans are given of the principal cities, and the boundaries are very distinctly laid down. Some confusion, however, is likely to arise from the fact that railways on the enlarged insets are shown in the same manner and colour as the boundaries in the principal map. Of the British Isles and most of the continents pairs of maps, physical and political, on the same scale, are given. In order to facilitate the comparison of the areas of different countries, equivalent projections have been largely used, and care has been taken to prevent overcrowding by a careful selection of the names given.

The publication of an atlas on this system is, beyond doubt, a step in the right direction. Faults undoubtedly do exist, but they are of a minor character, and can easily be rectified in another edition. There is room for improvement in the orographic colouring where green to indicate low altitudes is used, as this is often not at all in

keeping with the physical features of the country, especially in the case of deserts. This remark, however, applies to the majority of orographical maps. Generally speaking, this is a good atlas, and well suited to the purpose for which it has been published.

The World. **Stanford.**

Stanford's London Atlas of Universal Geography, exhibiting the physical and political divisions of the various countries of the world. Folio edition. One hundred maps, with a list of latitudes and longitudes. Second issue, revised and enlarged. London: E. Stanford, 1894. Price, £12. *Presented by the Publisher.*

In the second edition of this atlas the following important additions and alterations have been made: Plates 13, 19, 52, and 82, which appeared in the previous edition, have been omitted. A new map of Europe replaces the former map. New one-sheet maps of England, Scotland, and Ireland, without hills, replace those formerly given. There is also a map of Central London, on the scale of 4 inches to a mile, and a new map of Switzerland, which has been compiled from the best official and other documents, and produced by heliogravure. Maps of the Canary Islands and Madeira have been added. The map of Turkey in Asia on one sheet, which appeared in the former edition, has been replaced by maps of the Euphrates Valley and Asia Minor. With permission of the proprietor, Constable's map of the North-Western Frontier of India, the Pamir and part of Afghanistan, has been given, as well as new maps of Siam, Madagascar, the Argentine Republic, and New Guinea.

Special large scale maps of the following are given:—Channel Islands, Canary Islands, Madeira, the Bosphorus and Constantinople, Sea of Marmora, Maltese Islands, Cyprus, Ceylon, Borneo, Madagascar, Newfoundland, Jamaica, Bahamas, Leeward Islands, Windward Islands, Falkland Islands, and Fiji Archipelago.

In all the atlas contains 100 maps and numerous insets, no less than 27 of which are devoted to the British Isles, and 29 wholly or in part to the British Colonies. British North America is well represented by a series of maps, on which care has been taken to show all means of communication by rail up to date. Five maps are devoted to Africa, on which the "Spheres of Influence" of European powers are clearly indicated.

It will thus be seen that one of the principal features in this atlas is the large number of maps it contains of the British Isles and British possessions. These are in most cases on an unusually large scale. The London atlas has in this respect a marked advantage over other atlases. In most respects the compiler has evidently been careful to use recent and reliable material in order to bring the maps up to date. There is room, however, for improvement in some of the maps, as regards the manner in which the physical features are shown, and the orthography in the map of India requires correction, as in many instances the system employed is obsolete. For purposes of general reference, the atlas ought to be particularly useful.

CHARTS.

French Charts. **Service hydrographique de la Marine.**

No. 4784, Du Cap Pertusato à la Pointe de Sénétose, Les Moines, Corse, 1893.—4747, Rivière de Tourane (Song-Thu-Bon), Annam.—4765, Rivière de Hué, Côte d'Annam, 1893.—4770, Lagune entre Thuan-An et le Cua-Lac et Rivière de Ba-Truc, Côte d'Annam, 1893.—4817, Baie de Ranobé, Madagascar, Côte Ouest, 1893.—4797, Ports et Mouillages a la Côte Est de Madagascar, 1893.—4781, Mouillages à la Côte Ouest de Madagascar, 1893. Service hydrographique de la Marine, Paris. *Presented by the Service Hydrographique de la Marine, Paris.*

PHOTOGRAPHS.

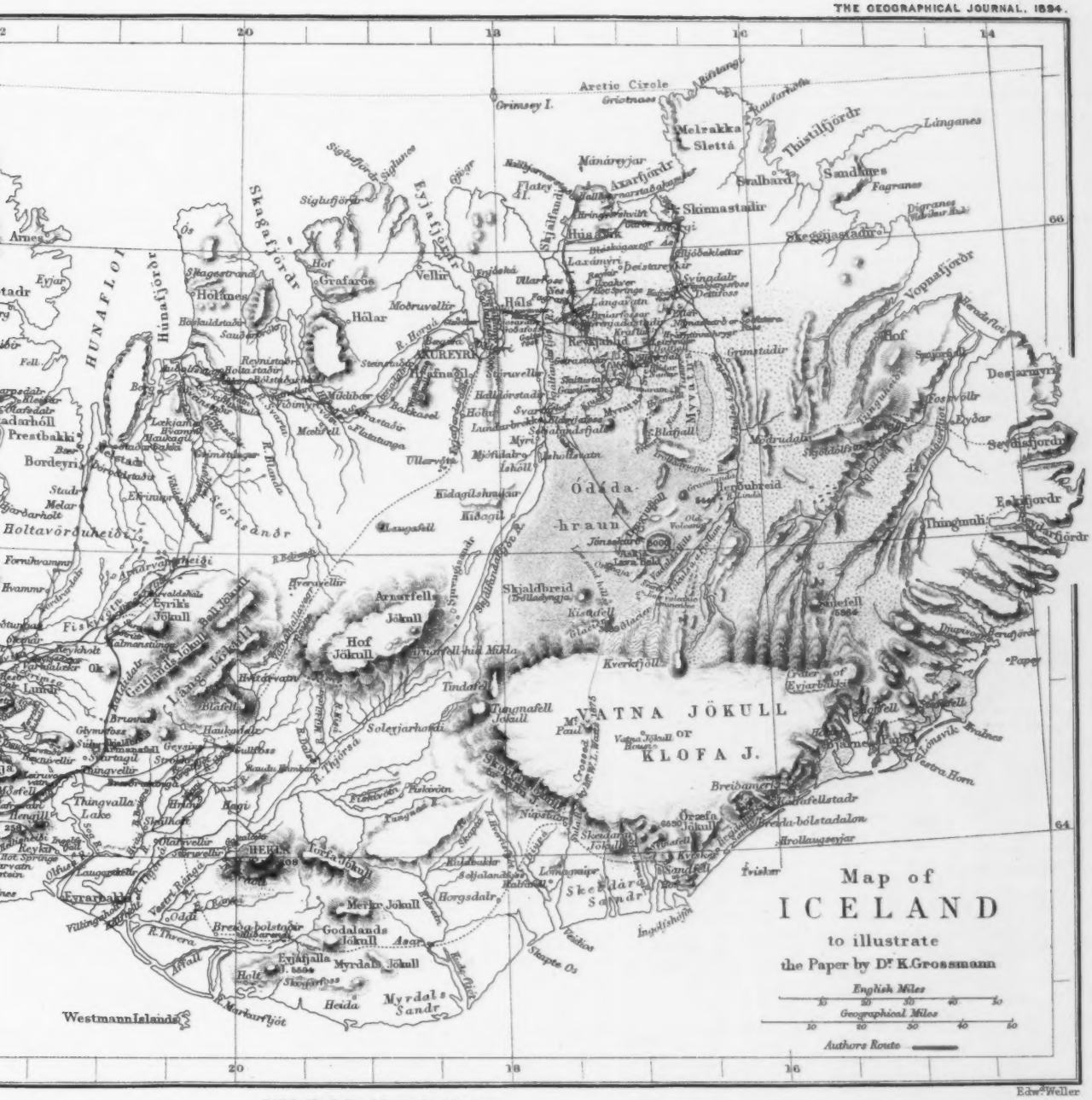
France. **Jackson.**

10 Photographs of Southern France in the neighbourhood of Nice. *Presented by Mr. James Jackson.*

This is a series of photographs taken by Mr. Jackson in Southern France; they are chiefly marine views, and are very nice specimens of photography.

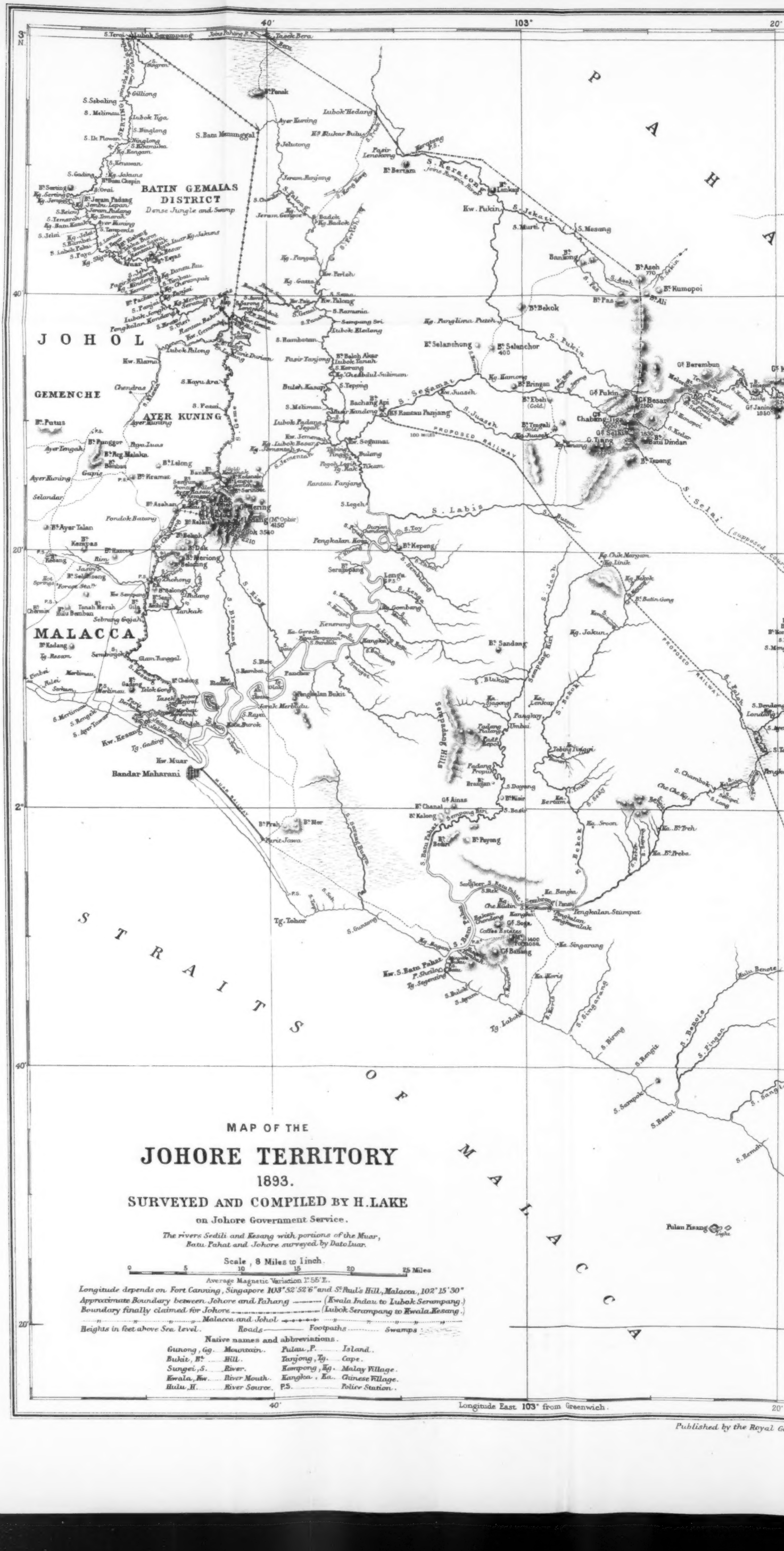
N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

24
22
C. Horn
Ísafjördr
Drangajökull
2328
Armúli
66
Arnarfjördr
Kúrgubakr
Glámujökull
2332
Stadr
Hrafnberg
Kollabiörr
Flatey I.
BREIDIFJÖRDR
Hyamsfjördr
65
Helgafell
Ingjaldshóll
Búdir
Stapi
Eldborg
Staðarstaðr
FAXA
FJÖRDR
Borgarfjördr
C. Akranes
Esja
REYKJAVIK
64
Hafnarfjördr
Kaldaðarnes
Sandgerdi
C. Reykjanes
F. L. 180 f.
Eldey I.
(Fuglaskar)
22



Edw.d Weller

Published by the Royal Geographical Society



MAP OF THE
JOHORE TERRITORY
1893.

SURVEYED AND COMPILED BY H. LAKE
on Johore Government Service.

The rivers Sedili and Kesang with portions of the Muar, Batu Pahat and Johore surveyed by Dato Luar.

Scale, 8 Miles to 1 inch.

0 5 10 15 20 25 Miles

Average Magnetic Variation 1° 55' E.

Longitude depends on Fort Canning, Singapore 103° 52' 52"6 and St. Paul's Hill, Malacca, 102° 15' 30"

Approximate Boundary between Johore and Pahang ——— (Kwala Indau to Lubok Serampang.)

Boundary finally claimed for Johore ——— (Lubok Serampang to Kwala Kesang.)

Malacca and Johol - - - - -

Heights in feet above Sea level. *Roads* ——— *Footpaths* ..... *Swamps*

Native names and abbreviations.

Gunong, Gg.	Mountain.	Pulau, P.	Island.
Bukit, Bt.	Hill.	Tanjong, Tg.	Cape.
Sungei, S.	River.	Kampong, Kg.	Malay Village.
Kwala, Kw.	River Mouth.	Kangka, Ka.	Chinese Village.
Hulu, H.	River Source.	P.S.	Police Station.

Published by the Royal G

20' 40' 104° 20' 3° N.

CHINA SEA

Kw. Rumpin
Kw. Pontean
Burong
Pulau Tioman
Chibeh
P. Babi
Sepa
Lais
Leigr
Tanas
Pulau Sibesar
Sanau
P. Kaban
Kechil
Kalang
Ujul
P. Mirzang
Arc Rock
P. Gita
Anak Indan
Kuala Indan
Pantjor
S. Kassim
S. Johore
S. Semalei
S. Serpang
Kg. Ranki China
S. Kenbar
Dusun Ringit
Telok Gunzong
Kg. Renekum
S. Buloh
S. Mentalowa
S. Pendam Kuding
Gd Kendok
Kg. Lemakau
S. Lemakau
S. Cheru
Olak Bendahara
Kg. Pahang
Kw. Sembrong
Bt Tanah Abang
Bt Lankap
Tabudah
S. Lenga
Kg. Mas
S. Bt Pengkalan
S. Tebong Ensing
S. Puchor
Kw. Kahang
Ty. Tuan
Gd Arong 1000
Ty. Arong
Pochong
Ty. Risang
Gd. Tioman
Gurung
Mensirip
P. Goal
Kalabang
P. Rawah
Ty. Silantai
P. Gajah
P. Stenan
N. Babi
Mid. Babi
P. Babi
Chawang Bt
Pulau Pemanggil
1507
P. Blarah
Ty. Skalap
Ty. Morau
Pulau Tinggi
1050
Ibul
Kampong
Lanain
Ty. Tingarah
Sungai Bt
P. Lima
Raleet I.
P. Sibu
350
Mid. Sibu
Sibu Tukas
S. Sibu
Belelei Bt
Gantung Bt
Chondong Bt
Ty. Leyman
Ty. Petai
Unexplored Hill country
S. Kemaman
S. Kuantan
S. Pahang
S. Lemon
Kw. Madek
Tampui Mambong
S. Kuchang
Kerlaur
S. Daraw Pangang
Bt Kusu
Bt Bebab
Jekting
S. Yong
S. Singa
S. Serdang
S. Madek
S. Blat
S. Lemeat
Gd Chimundong
S. Medang
Bt Jakas
Gd Blumut 3000?
Gd Bechuak 2100?
Chenddia Bamban
Bukit Kahang
BLUMUT RANGE
Bt Jamal 4400
Bt Pantjau 1900
50 MILES
S. Sedili Besar
Gd Tunjok Kaut 1270
Gd Muntahan 2150
Gd Panti 1500
Kg. Bahru
Kg. Pudu
Kg. Cherki
Bt Tekar
Bt Gaong
Batuk Lebak
Kg. Bodau
Kg. Kembut
Kw. Sedili
Kw. Sedili Kechil
Ty. Londang Wei
Ty. Malesa
Ty. Tenggor
Ty. Balau
Lompat
Ty. Setajam
Ty. Pergei
Kg. Langat
S. Sayong
Kg. Kelek
Kg. Pulai
Kg. Jelang
Drumchan Estate
Kg. Ayer Kuning
Kg. Ayer Rawah
S. Tenkis
Penglakan Tenkis
Kg. Lemak
Kg. Tenkis
Kg. Kenik
Bt Kompang
Bt Giam
Bt Parit
Kw. Selai
S. Mengkeli
Pengkalan Pomang
Umbong
S. Chundung
S. Ayer Rawah
Kg. Kelang
Kg. Kapar
Kg. Rambah
P. Kulub
Kampong
Ty. Kulub
Ty. Gul
Ty. Pulos
Merambong
Ayer Chawan
Ayer Merbau
Blakangmati
SINGAPORE
The Roads
ISLAND OF SINGAPORE
JOHORE
Johore Bahru
Johore Lama
Kg. Jawa
Ty. Stapa
Ty. Kesam
Ty. Tekimpang
Ty. Rambah
Ty. Batu
Ty. Merlawang
Ty. Kedah
Ty. Katong
Ty. Mandai
Ty. Rimau
Ty. Berlayer
Ty. Berlayer
Ty. Berlayer